```
 1 *------------------------------------------------------------
   --*
 2 User:                   u63452984
 3 Date:                   07 January 2024
 4 Time:                   06:40:44
 5 Site:                   70094220
 6 Platform:               Linux
 7 Maintenance Release: 9.04.01M7P080620
 8 EM Version:             15.2
 9 *
10 *------------------------------------------------------------
   --*
11 * Training Log
12 Date:                   07 January 2024
13 Time:                   06:40:04
14 *------------------------------------------------------------
   --*
15 15242  proc freq data=EMWS3.HPDMForest_VariableSet noprint;
16 15243  table ROLE*LEVEL/out=WORK.HPDMForestMETA;
17 15244  run;
18 15245  proc print data=WORK.HPDMForestMETA label noobs;
19 15246  var ROLE LEVEL COUNT;
20 15247  label ROLE = "%sysfunc(sasmsg(sashelp.dmine, meta_ro
   le_vlabel, NOQUOTE))" LEVEL = "%sysfunc(sasmsg(sashelp.dmin
   e, meta_level_vlabel, NOQUOTE))" COUNT = "%sysfunc(sasmsg(s
   ashelp.dmine, rpt_count_vlabel, NOQUOTE))";
21 15248  title9 ' ';
22 15249  title10 "%sysfunc(sasmsg(sashelp.dmine, rpt_varSumma
   ry_title  , NOQUOTE))";
23 15250  run;
24 15251  title10;
25 15252  %let EMNORLEN = %DMNORLEN;
26 EMWS3.Part2_TRAIN EMWS3.Part2_TRAIN
27 EMWS3.Part2_TRAIN EMWS3.Part2_TRAIN EMWS3 Part2_TRAIN
28 EMWS3.Part2_TRAIN EMWS3.Part2_TRAIN
29 EMWS3.Part2_TRAIN EMWS3.Part2_TRAIN EMWS3 Part2_TRAIN
```

```
30 Executing  SASHELP.EMCORE.EMINFOITERATOR.SCL _INIT >>
31 Executing  SASHELP.EMCORE.EMINFOITERATOR.SCL setMetaData >>
32 Executing  SASHELP.EMCORE.EMINFOITERATOR.SCL next >>
33 Executing  SASHELP.EMCORE.EMINFOITERATOR.SCL setMetaData >>
34 Executing  SASHELP.EMCORE.EMINFOITERATOR.SCL next >>
35 Executing  SASHELP.EMCORE.EMINFOITERATOR.SCL _term >>
36 15299  data WORK.HPDMForest_EVENT(KEEP=VARIABLE LABEL LEVEL
    EVENT NUMLEVELS ORDER);
37 15300  length ORDER $20;
38 15301  label VARIABLE = "%sysfunc(sasmsg(sashelp.dmine, rpt
   _target_vlabel,  NOQUOTE))" EVENT = "%sysfunc(sasmsg(sashel
   p.dmine, assmt_event_vlabel, NOQUOTE))" NUMLEVELS = "%sysfu
   nc(sasmsg(sashelp.dmine, rpt_numcat_vlabel, NOQUOTE))" LEVE
   L =
39 15302     "%sysfunc(sasmsg(sashelp.dmine, meta_level_vlabel
   , NOQUOTE))" ORDER = "%sysfunc(sasmsg(sashelp.dmine, meta_o
   rder_vlabel, NOQUOTE))" LABEL = "%sysfunc(sasmsg(sashelp.dm
   ine, meta_label_vlabel, NOQUOTE))";
40 15303  set EMWS3.HPDMFOREST_IMP_CHURN_DM( where=(_TYPE_="TA
   RGET"));
41 15304  NumLevels=2;
42 15305  select(upcase(ORDER));
43 15306  when('DESC') ORDER = 'Descending';
44 15307  when('ASC') ORDER = 'Ascending';
45 15308  when('FMTDESC') ORDER = 'Formatted Descending';
46 15309  when('FMTASC') ORDER = 'Formatted Ascending';
47 15310  otherwise ORDER = 'Descending';
48 15311  end;
49 15312  output;
50 15313  run;
51 15314  title9 ' ';
52 15315  proc print data=WORK.HPDMForest_EVENT noobs label;
53 15316  var VARIABLE EVENT LEVEL NUMLEVELS ORDER LABEL;
54 15317  title9 ' ';
55 15318  title10 "%sysfunc(sasmsg(sashelp.dmine, rpt_modelEve
   nt_title  , NOQUOTE))";
```

```
56 15319  run;
57 15320  title10;
58 "No decisions defined for target "IMP_Churn"."
59 15321  proc print data = EMWS3.HPDMForest_IMP_Churn_DM noob
   s label;
60 15322  var _type_ variable label;
61 15323  where _type_ ^in('MATRIX', 'DECISION', 'TRAINPRIOR',
    'DATAPRIOR', 'DECPRIOR');
62 15324  label _TYPE_ = "%sysfunc(sasmsg(sashelp.dmine, rpt_t
   ype_vlabel,     NOQUOTE))" VARIABLE = "%sysfunc(sasmsg(sash
   elp.dmine, rpt_variable_vlabel, NOQUOTE))" LABEL = "%sysfun
   c(sasmsg(sashelp.dmine, meta_label_vlabel, NOQUOTE))";
63 15325  title9 ' ';
64 15326  title10 "%sysfunc(sasmsg(sashelp.dmine, rpt_predDecV
   ars_title  , NOQUOTE))";
65 15327  run;
66 15328  title10;
67 15329  %let EMEXCEPTIONSTRING=;
68 PERFORMANCE  DETAILS
69 15776  *-------------------------------------------------
   ---------*;
70 15777  * HPDMForest: Generation of macros and macro variabl
   es;
71 15778  * To see the code generated, set the EM_DEBUG macro
   variable to SOURCE or _ALL_;
72 15779  *-------------------------------------------------
   ---------*;
73
74 15780  %let EMEXCEPTIONSTRING=;
75 15781  *-------------------------------------------------
   ---------*;
76 15782  * TRAIN: HPDMForest;
77 15783  *-------------------------------------------------
   ---------*;
78 15784  %let EM_ACTION = TRAIN;
79 15785  %let syscc = 0;
```

```
 80 15786  %macro main;
 81 15787
 82 15788     %if %upcase(&EM_ACTION) = CREATE %then %do;
 83 15789         filename temp catalog 'sashelp.hpdm.hpdmfores
    t_create.source';
 84 15790         %include temp;
 85 15791         filename temp;
 86 15792         %hpdm_Forest_create;
 87 15793     %end;
 88 15794     %else
 89 15795     %if %upcase(&EM_ACTION) = TRAIN %then %do;
 90 15796         filename temp catalog 'sashelp.hpdm.hpdmfores
    t_train.source';
 91 15797         %include temp;
 92 15798         filename temp;
 93 15799         %hpdm_Forest_train;
 94 15800     %end;
 95 15801     %else
 96 15802     %if %upcase(&EM_ACTION) = SCORE %then %do;
 97 15803         %em_checkmacro(name=EM_PROPERTY_VARSELECT, va
    lue=Y, global=Y);
 98 15804         %em_checkmacro(name=EM_PROPERTY_VIMETHOD, val
    ue=LOSSREDUCTION);
 99 15805          %if "&EM_PROPERTY_VARSELECT" eq "Y" and "&EM
    _PROPERTY_VIMETHOD" = "RBA" %then %do;
100 15806             %em_getname(key=OUTMDLFILE, type=FILE, e
    xtension=bin);
101 15807             %if %sysfunc(fileexist(&EM_USER_OUTMDLFI
    LE))=0 %then %do;
102 15808                 /* when the Variable Importance meth
    od has changed to RBA after running with Use as Modeling=No
    , need to re-train to create the outmdl file */
103 15809                filename temp catalog 'sashelp.hpdm.h
    pdmforest_train.source';
104 15810                %include temp;
105 15811                filename temp;
```

```
106 15812                %hpdm_Forest_train;
107 15813             %end;
108 15814          %end;
109 15815          filename temp catalog 'sashelp.hpdm.hpdmfore
    st_score.source';
110 15816          %include temp;
111 15817          filename temp;
112 15818          %hpdm_Forest_score;
113 15819     %end;
114 15820     %else
115 15821     %if %upcase(&EM_ACTION) = REPORT %then %do;
116 15822         filename temp catalog 'sashelp.hpdm.hpdmfores
    t_report.source';
117 15823         %include temp;
118 15824         filename temp;
119 15825         %hpdm_Forest_report;
120 15826     %end;
121 15827     %else
122 15828
123 15829  %mend main;
124 15830
125 15831  %main;
126 NOTE: %INCLUDE (level 1) file TEMP is file SASHELP.HPDM.HPD
    MFOREST_TRAIN.SOURCE.
127 15832 +%Macro hpdm_Forest_Train;
128 15834 +   /* retrieve data to model based on presence of gr
    id processing */
129 15835 +   %em_getname(key=HPDS2SCORE, type=FILE, extension=
    sas);
130 15836 +   %hpdm_dataprep(data=, out=, metadata=, code=, ROL
    E=TRAIN, where=,
131 15837 +         outDS2Code=&em_user_HPDS2SCORE, append=N, ho
    st=, nodes=, nthreads=, details=);
132 15839 +   /* check for the existence of EM_HPDM_TRAIN table
     */
133 15840 +   %if &EM_HPDM_TRAIN eq  %then %do;
```

```
134 15841 +       %let EMEXCEPTIONSTRING = exception.server.IMP
    ORT.NOTRAIN,1;
135 15842 +       %put &em_codebar;
136 15843 +       %let errormsg = %sysfunc(sasmsg(sashelp.dmine
    , error_nodeTrainRawData_note, NOQUOTE));
137 15844 +       %put &errormsg;
138 15845 +       %put &em_codebar;
139 15846 +       %goto doendm;
140 15847 +   %end;
141 15848 +   %else
142 15849 +       %let EMEXCEPTIONSTRING =;
143 15851 +   %if ^%sysfunc(exist(&EM_HPDM_TRAIN)) AND ^%sysfun
    c(exist(&EM_HPDM_TRAIN, VIEW)) %then %do;
144 15852 +       %let EMEXCEPTIONSTRING = exception.server.IMP
    ORT.NOTRAIN,1;
145 15853 +       %put &em_codebar;
146 15854 +       %let errormsg = %sysfunc(sasmsg(sashelp.dmine
    , error_nodeTrainRawData_note, NOQUOTE));
147 15855 +       %put &errormsg;
148 15856 +       %put &em_codebar;
149 15857 +       %goto doendm;
150 15858 +   %end;
151 15859 +   %else
152 15860 +       %let EMEXCEPTIONSTRING =;
153 15863 +   /* Check for the existence of one target variable
    */
154 15864 +   %if  &EM_NUM_TARGET ne 1 %then %do;
155 15865 +        %let EMEXCEPTIONSTRING = exception.server.US
    E1TARGET;
156 15866 +        %put &em_codebar;
157 15867 +        %let errormsg = %sysfunc(sasmsg(sashelp.dmin
    e, metadata.use01target_err, NOQUOTE));
158 15868 +        %put &errormsg;
159 15869 +        %put &em_codebar;
160 15870 +        %goto doendm;
161 15871 +   %end;
```

```
162 15872 +   %else
163 15873 +       %let EMEXCEPTIONSTRING =;
164 15875 +   /* Check target measurement level and throw excep
    tion if ordinal target is detected */
165 15876 +   %if %EM_TARGET_LEVEL eq ORDINAL %then %do;
166 15877 +       %let EMEXCEPTIONSTRING = exception.server.ME
    TADATA.INVALIDORDINALTARGET;
167 15878 +       %put &em_codebar;
168 15879 +       %let errormsg = %sysfunc(sasmsg(sashelp.dmin
    e, ordinaltargetpresent_note, NOQUOTE));
169 15880 +       %put &errormsg;
170 15881 +       %put &em_codebar;
171 15882 +       %goto doendm;
172 15883 +   %end;
173 15884 +   %else
174 15885 +       %let EMEXCEPTIONSTRING =;
175 15887 +   /* Check for the existence of one input variable*
    /
176 15888 +   %if  (&EM_NUM_INTERVAL_INPUT < 1) and (&EM_NUM_BI
    NARY_INPUT < 1) and (&EM_NUM_ORDINAL_INPUT < 1)
177 15889 +       and (&EM_NUM_NOMINAL_INPUT < 1) and (&EM_NUM
    _INTERVAL_REJECTED < 1) and (&EM_NUM_BINARY_REJECTED < 1)
178 15890 +        and (&EM_NUM_ORDINAL_REJECTED < 1) and (&EM
    _NUM_NOMINAL_REJECTED < 1)%then %do;
179 15891 +       %let EMEXCEPTIONSTRING = exception.server.US
    EATLEAST1INPUTREJECT;
180 15892 +       %put &em_codebar;
181 15893 +       %let errormsg = %sysfunc(sasmsg(sashelp.dmin
    e, error_noInput_note, NOQUOTE));
182 15894 +       %put &errormsg;
183 15895 +       %put &em_codebar;
184 15896 +       %goto doendm;
185 15897 +   %end;
186 15898 +   %else
187 15899 +       %let EMEXCEPTIONSTRING =;
188 15901 +    %em_checkmacro(name=EM_PROPERTY_MODELING, value=
```

```
    Y, global=Y);
189 15903 +    %if "&EM_PROPERTY_MODELING" eq "Y" %then %do;
190 15904 +       %let EM_TOOLTYPE = MODEL;
191 15905 +    %end;
192 15906 +    %else  %do;
193 15907 +       %let EM_TOOLTYPE = UTIL;
194 15908 +       %if %sysfunc(exist(&em_data_eminfo)) %then %d
    o;
195 15909 +          proc delete data=&em_data_eminfo;
196 15910 +          run;
197 15911 +       %end;
198 15912 +    %end;
199 15914 +   /* data sets */
200 15915 +   %EM_GETNAME(KEY=ITERATION, type=DATA);
201 15916 +   %EM_GETNAME(KEY=VARIMPORT, type=DATA);
202 15917 +   %EM_GETNAME(KEY=BASELINE, type=DATA);
203 15919 +   %let out=;
204 15920 +   %if "&em_hpdm_train" ne "&em_import_data" %then %
    do;
205 15921 +      %let out = &em_hpdm_train_score;
206 15922 +   %end;
207 15924 +   %let traindata = &EM_HPDM_TRAIN;
208 15925 +   %if "&em_hpdm_train" eq "&em_import_data" %then %
    do;
209 15926 +      /* check if a training and validate table are
    passed in as 2 seperate tables; if so, */
210 15927 +      /* create one table containing the _partind_ v
    ariable to be used for modelling       */
211 15928 +      %if (%sysfunc(exist(&em_import_data)) or %sysf
    unc(exist(&em_import_data, VIEW))) and
212 15929 +          ("&EM_IMPORT_VALIDATE" ne "") and (%sysfun
    c(exist(&em_import_validate)) or %sysfunc(exist(&em_import_
    validate, VIEW))) %then %do;
213 15930 +             %let traindata = &EM_NODEID._traindata;
214 15931 +             data &traindata  / view=&traindata;
215 15932 +                set &em_import_data(in=_a) &em_impor
```

```
    t_validate(in=_b);
216 15933 +                if _a then _PartInd_ = 1;
217 15934 +                else _PartInd_=0;
218 15935 +             run;
219 15936 +      %end;
220 15937 +   %end;
221 15939 +    * retrieve the ordering of the target variable f
    rom DECMETA;
222 15940 +    * and use it to determine the event level for no
    n-interval target;
223 15941 +   %if %EM_TARGET_LEVEL ne INTERVAL %then %do;
224 15942 +       proc sql noprint;
225 15943 +           select order into :_target_order from &EM
    _DEC_DECMETA
226 15944 +               where upcase(variable) eq "%upcase(%E
    M_TARGET)";
227 15945 +       quit;
228 15946 +   %end;
229 15947 +   %else %let _target_order =;
230 15949 +   /* load hpforest macros */
231 15950 +   filename temp catalog 'sashelp.hpdm.hpdmforest_ma
    cros.source';
232 15951 +   %include temp;
233 15952 +   filename temp;
234 15955 +    /* run HPForest model */
235 15956 +    %HPDM_HPForest(indata=&traindata,
236 15957 +           target = %EM_TARGET,
237 15958 +           targetOrder = &_target_order,
238 15959 +           alpha=&EM_PROPERTY_ALPHA,
239 15960 +           catbins=&EM_PROPERTY_CATBINS,
240 15961 +           exhaustive=&EM_PROPERTY_EXHAUSTIVE,
241 15962 +           leafsizemethod=&EM_PROPERTY_LEAFSIZEMETHO
    D,
242 15963 +           leaffraction=&EM_PROPERTY_LEAFFRACTION,
243 15964 +           leafsize=&EM_PROPERTY_LEAFSIZE,
244 15965 +           maxdepth=&EM_PROPERTY_MAXDEPTH,
```

```
245 15966 +           maxtrees=&EM_PROPERTY_MAXTREES,
246 15967 +           mincatsize=&EM_PROPERTY_MINCATSIZE,
247 15968 +           seed=&EM_PROPERTY_SEED,
248 15969 +           splitsize=&EM_PROPERTY_SPLITSIZE,
249 15970 +           numobsmethod=&EM_PROPERTY_NUMOBSMETHOD,
250 15971 +           trainfraction=&EM_PROPERTY_TRAINFRACTION,
251 15972 +           trainn=&EM_PROPERTY_TRAINN,
252 15973 +           vars_to_try=&EM_PROPERTY_VARS_TO_TRY,
253 15974 +           missing=&EM_PROPERTY_MISSING,
254 15975 +           minuseinsearch=&EM_PROPERTY_MINUSEINSEARC
    H,
255 15976 +           %if &out ne "" %then %do;
256 15977 +             out=&out,
257 15978 +           %end;
258 15979 +           outbase=&EM_USER_BASELINE,
259 15980 +           outiter=&EM_USER_ITERATION,
260 15981 +           outimport=&EM_USER_VARIMPORT
261 15982 +           );
262 15984 +   /* delete temporary traindata is training and val
    idate are both passed into the node */
263 15985 +    %if "&traindata" ne "&em_hpdm_train" %then %do;
264 15986 +      proc datasets lib=work nolist;
265 15987 +        delete &traindata /mt=view;
266 15988 +      run;
267 15989 +    %end;
268 15991 +    %if "&EM_PROPERTY_MODELING" eq "Y" %then %do;
269 15993 +        /* create flow and publish score code */
270 15994 +        filename flowref "&EM_FILE_EMFLOWSCORECODE";
271 15995 +        filename pubref "&EM_FILE_EMPUBLISHSCORECODE
    ";
272 15997 +        %em_getname(key=OUTMDLFILE, type=FILE, exten
    sion=bin);
273 15999 +        /* add decision and residual score code; cre
    ate classification tables and fit statistics on the model *
    /
274 16000 +        %em_model(DATA=, TARGET=&EM_DEC_TARGET, DECS
```

```
    CORECODE=Y, CLASSIFICATION=Y, FITSTATISTICS=Y, RESIDUALS=Y)
    ;
275 16002 +        %global hpfst_score_input hpfst_score_output
    ;
276 16003 +        %let hpfst_score_input = &em_score_output;
277 16004 +        %let hpfst_score_output = &em_score_output;
278 16006 +        data _null_;
279 16007 +          file flowref;
280 16008 +          set &EM_DATA_VARIABLESET(where=((ROLE='INP
    UT' and USE in('Y', 'D')) or ROLE='REJECTED' and USE='Y'))
    end=eof;
281 16010 +          if _n_=1 then do;
282 16011 +            put '%macro em_hpfst_score;';
283 16012 +            put ' ';
284 16014 +            put '  %if %sysfunc(exist(work._score_te
    mp)) %then %do;';
285 16015 +            put '     proc delete data=work._score_t
    emp;';
286 16016 +            put '     run;';
287 16017 +            put '  %end;';
288 16019 +            put ' ';
289 16020 +            put '  %if %symexist(hpfst_score_input)=
    0 %then %let hpfst_score_input=&em_score_output;';
290 16021 +            put '  %if %symexist(hpfst_score_output)
    =0 %then %let hpfst_score_output=&em_score_output;';
291 16022 +            put ' ';
292 16023 +            put '%let hpvvn= %sysfunc(getoption(VALI
    DVARNAME));';
293 16024 +            put 'options validvarname=V7;';
294 16026 +            put '  proc hp4score data=&hpfst_score_i
    nput(keep=';
295 16027 +          end;
296 16029 +          /* only keeps variables used as input */
297 16030 +          put NAME;
298 16032 +          if eof then do;
299 16033 +            put " %EM_KEY ); ";
```

```
300  16035 +            %if &EM_NUM_KEY  %then %do;
301  16036 +              put "  ID %EM_KEY ;";
302  16037 +            %end;
303  16038 +            put '  %if %symexist(EM_USER_OUTMDLFILE)
     =0 %then %do;';
304  16039 +            put '    score file="' @;
305  16040 +            put "&EM_USER_OUTMDLFILE" @;
306  16041 +            put '" out=work._outtemp;';
307  16042 +            put '  %end;';
308  16043 +            put '  %else %do;';
309  16044 +            put '    score file="&EM_USER_OUTMDLFILE
     " out=work._outtemp;';
310  16045 +            put '  %end;';
311  16046 +            %if %length(&hpdm_performance)=0 %then %
     let hpdm_performance = PERFORMANCE;
312  16047 +            put "    &hpdm_performance nthreads=1;";
313  16048 +            put "  run;";
314  16049 +            put " ";
315  16050 +            put 'options validvarname=&hpvvn;';
316  16051 +            put '  data work._score_temp;';
317  16052 +            put '     merge &hpfst_score_input work.
     _outtemp;';
318  16053 +            put "  run;";
319  16054 +            put " ";
320  16055 +            put "  proc delete data=work._outtemp;";
321  16056 +            put "  run;";
322  16057 +            put " ";
323  16058 +            put '  data &hpfst_score_output;';
324  16059 +            put '    set work._score_temp;';
325  16060 +            put '%mend;';
326  16061 +            put ' ';
327  16062 +            put '%symdel hpfst_score_input hpfst_sco
     re_output EM_USER_OUTMDLFILE/nowarn;';
328  16063 +            put '%em_hpfst_score;';
329  16064 +          end;
330  16065 +        run;
```

```
331 16067 +        /* need to have different flow and publish c
    ode - so no writing to work and merging */
332 16068 +        data _null_;
333 16069 +          file pubref;
334 16071 +            put '%macro em_hpfst_score;';
335 16072 +            put ' ';
336 16074 +            put '  %if %symexist(hpfst_score_input)=
    0 %then %let hpfst_score_input=&em_score_output;';
337 16075 +            put '  %if %symexist(hpfst_score_output)
    =0 %then %let hpfst_score_output=&em_score_output;';
338 16076 +            put '  %if %symexist(hpfst_id_vars)=0 %t
    hen %let hpfst_id_vars = _ALL_;';
339 16077 +            put ' ';
340 16078 +            put '  %let hpvvn= %sysfunc(getoption(VA
    LIDVARNAME));';
341 16079 +            put '  options validvarname=V7;';
342 16081 +            put '  proc hp4score data=&hpfst_score_i
    nput;';
343 16083 +            put '  id &hpfst_id_vars;';
344 16085 +            put '  %if %symexist(EM_USER_OUTMDLFILE)
    =0 %then %do;';
345 16086 +            put '      %let hpfinEM=1;';
346 16087 +            put '    score file="' @;
347 16088 +            put "&EM_USER_OUTMDLFILE" @;
348 16089 +            put '" out=&hpfst_score_output;';
349 16090 +            put '  %end;';
350 16091 +            put '  %else %do;';
351 16092 +            put '      %let hpfinEM=0;';
352 16093 +            put '      score file="&EM_USER_OUTMDLFI
    LE" out=&hpfst_score_output;';
353 16094 +            put '  %end;';
354 16095 +            put "    &hpdm_performance;";
355 16096 +            put "  run;";
356 16097 +            put " ";
357 16098 +            put '  options validvarname=&hpvvn;';
358 16099 +            put " ";
```

```
359  16100 +            put '  data &hpfst_score_output;';
360  16101 +            put '     set &hpfst_score_output;';
361  16102 +            put '     %if &hpfinEM %then %do;';
362  16103 +            put '         %symdel hpfst_score_input
     hpfst_score_output  EM_USER_OUTMDLFILE  / nowarn; ';
363  16104 +            put '     %end;';
364  16105 +            put '%mend;';
365  16106 +            put ' ';
366  16107 +            put '%em_hpfst_score;';
367  16108 +         run;
368  16110 +         filename pubref;
369  16111 +         filename flowref;
370  16113 +         %if "&out" ne "" %then %do;
371  16114 +           /* Create EMHPDMSCORE to Score in a grid e
     nvironment */
372  16115 +           %em_getname(key=EMHPDMSCORE, type=FILE, ex
     tension=sas);
373  16116 +           filename _hpdmfrf "&em_user_emhpdmscore";
374  16118 +           data _null_;
375  16119 +              file _hpdmfrf;
376  16120 +             put '%macro em_hpfst_score;';
377  16121 +             put ' ';
378  16123 +             put '  %if %symexist(hpfst_score_input)=
     0 %then %let hpfst_score_input=&em_score_output;';
379  16124 +             put '  %if %symexist(hpfst_score_output)
     =0 %then %let hpfst_score_output=&em_score_output;';
380  16125 +             put '  %if %symexist(hpfst_id_vars)=0 %t
     hen %let hpfst_id_vars = _ALL_;';
381  16126 +             put ' ';
382  16127 +             put '  %let hpvvn= %sysfunc(getoption(VA
     LIDVARNAME));';
383  16128 +             put '  options validvarname=V7;';
384  16130 +             put '  proc hp4score data=&hpfst_score_i
     nput;';
385  16132 +             put '  id &hpfst_id_vars;';
386  16134 +             put '  %if %symexist(EM_USER_OUTMDLFILE)
```

```
    =0 %then %do;';
387 16135 +            put '    score file="' @;
388 16136 +            put "&EM_USER_OUTMDLFILE" @;
389 16137 +            put '" out=&hpfst_score_output;';
390 16138 +            put '  %end;';
391 16139 +            put '  %else %do;';
392 16140 +            put '    score file="&EM_USER_OUTMDLFILE
    " out=&hpfst_score_output;';
393 16141 +            put '  %end;';
394 16142 +            put "    &hpdm_performance;";
395 16143 +            put "  run;";
396 16144 +            put " ";
397 16145 +            put '  options validvarname=&hpvvn;';
398 16146 +            put " ";
399 16147 +            put '%mend;';
400 16148 +            put ' ';
401 16149 +            put '%em_hpfst_score;';
402 16150 +            put '%symdel hpfst_score_input hpfst_sco
    re_output EM_USER_OUTMDLFILE/nowarn;';
403 16151 +          run;
404 16153 +          filename _hpdmfrf;
405 16155 +          %hpdm_node_assess(data=&out, DECMETA=&EM_D
    EC_DECMETA);
406 16156 +          proc delete data=&out;
407 16157 +          run;
408 16159 +        %end;
409 16161 +    %end; /* end MODELING */
410 16163 +    /* Always have HPDMScore Empty not to break HPDM
    _DATAPREP macro */
411 16164 +     %em_getname(key=HPDMSCORE, type=FILE, extension
    =sas);
412 16165 +     filename _hpdmfrf "&em_user_hpdmscore";
413 16166 +     data _null_;
414 16167 +        file _hpdmfrf;
415 16168 +        put ' ';
416 16169 +     run;
```

```
417  16170 +     filename _hpdmfrf;
418  16172 +    %if &sysrc >4 %then %do;
419  16173 +      %goto doendem;
420  16174 +    %end;
421  16176 +    %doendem:
422  16178 +%Mend hpdm_Forest_Train;
423  NOTE: %INCLUDE (level 1) ending.
424  NOTE: Fileref TEMP has been deassigned.
425  NOTE: %INCLUDE (level 1) file _HPFLOW is file SASHELP.EMUTI
     L.EM_PATHSCORECODE.SOURCE.
426  16182 +%macro EM_PATHSCORECODE(NODEID=, STARTNODEID=, FLOW=
     , PUBLISH=, HPDM=, OUTPATH=);
427  16183 +   proc display c=sashelp.emcore.pathscorecode.scl;
428  16184 +   run;
429  16185 +%mend EM_PATHSCORECODE;
430  16186 +
431  NOTE: %INCLUDE (level 1) ending.
432  NOTE: Fileref _HPFLOW has been deassigned.
433
434  16187  data WORK._SCORECODE;
435  16188  length Parent $32 nodelabel $32 description $200 too
     ltype $32 component $32 FlowScoreCodeFormat PublishScoreCod
     e $16 PublishScoreCodeFormat $8 accumulatedScoreCode $1;
436  16189  nodelabel="Ids";
437  16190  parent=" ";
438  16191  description="Input Data Source";
439  16192  component="DataSource";
440  16193  tooltype="SAMPLE";
441  16194  FlowScoreCodeFormat="DATASTEP";
442  16195  PublishScoreCode="EMPUBLISHSCORECODE";
443  16196  PublishScoreCodeFormat="DATASTEP";
444  16197  accumulatedScoreCode= "N";
445  16198  output;
446  16199  nodelabel="Impt";
447  16200  parent="Ids";
448  16201  description="Imputation";
```

```
449 16202  component="Impute";
450 16203  tooltype="MODIFY";
451 16204  FlowScoreCodeFormat="DATASTEP";
452 16205  PublishScoreCode="EMPUBLISHSCORECODE";
453 16206  PublishScoreCodeFormat="DATASTEP";
454 16207  accumulatedScoreCode= "N";
455 16208  output;
456 16209  nodelabel="Part2";
457 16210  parent="Impt";
458 16211  description="Partition Class";
459 16212  component="Partition";
460 16213  tooltype="SAMPLE";
461 16214  FlowScoreCodeFormat="DATASTEP";
462 16215  PublishScoreCode="EMFLOWSCORECODE";
463 16216  PublishScoreCodeFormat="DATASTEP";
464 16217  accumulatedScoreCode= "N";
465 16218  output;
466 16219  run;
467
468 NOTE: The data set WORK._SCORECODE has 3 observations and 9
     variables.
469 NOTE: DATA statement used (Total process time):
470       real time           0.00 seconds
471       user cpu time       0.00 seconds
472       system cpu time     0.00 seconds
473       memory              30324.87k
474       OS Memory           40560.00k
475       Timestamp           07/01/2024 06:40:05 AM
476       Step Count                        1  Switch Count  0
477       Page Faults                       0
478       Page Reclaims                     94
479       Page Swaps                        0
480       Voluntary Context Switches        0
481       Involuntary Context Switches      0
482       Block Input Operations            0
483       Block Output Operations           264
```

```
484
485
486 NOTE: PROCEDURE DISPLAY used (Total process time):
487       real time           0.03 seconds
488       user cpu time       0.00 seconds
489       system cpu time     0.00 seconds
490       memory              30324.87k
491       OS Memory           40560.00k
492       Timestamp           07/01/2024 06:40:05 AM
493       Step Count                        1  Switch Count  1
494       Page Faults                       0
495       Page Reclaims                     174
496       Page Swaps                        0
497       Voluntary Context Switches        9
498       Involuntary Context Switches      0
499       Block Input Operations            0
500       Block Output Operations           304
501
502
503
504 NOTE: There were 1 observations read from the data set WORK
    ._SCORECODE.
505       WHERE UPCASE(component) in ('DATASOURCE', 'HPDMPARTIT
    ION', 'HPTMINE');
506 NOTE: DATA statement used (Total process time):
507       real time           0.00 seconds
508       user cpu time       0.01 seconds
509       system cpu time     0.00 seconds
510       memory              30324.87k
511       OS Memory           40560.00k
512       Timestamp           07/01/2024 06:40:05 AM
513       Step Count                        1  Switch Count  0
514       Page Faults                       0
515       Page Reclaims                     74
516       Page Swaps                        0
517       Voluntary Context Switches        0
```

```
518       Involuntary Context Switches      0
519       Block Input Operations            0
520       Block Output Operations           0
521
522
523
524 NOTE: There were 1 observations read from the data set EMWS
    3.IDS_EMINFO.
525       WHERE KEY in ('HPDMSAMPLE', 'HPPART', 'HPPART_DATA',
    'IDSTABLE');
526 NOTE: DATA statement used (Total process time):
527       real time           0.00 seconds
528       user cpu time       0.00 seconds
529       system cpu time     0.00 seconds
530       memory              30324.87k
531       OS Memory           40560.00k
532       Timestamp           07/01/2024 06:40:05 AM
533       Step Count                        1  Switch Count  0
534       Page Faults                       0
535       Page Reclaims                     61
536       Page Swaps                        0
537       Voluntary Context Switches        1
538       Involuntary Context Switches      0
539       Block Input Operations            0
540       Block Output Operations           0
541
542
543
544 NOTE: There were 0 observations read from the data set EMWS
    3.IDS_EMINFO.
545       WHERE (TARGET='HPDM') or (KEY='HPPART_DATA');
546 NOTE: DATA statement used (Total process time):
547       real time           0.00 seconds
548       user cpu time       0.00 seconds
549       system cpu time     0.00 seconds
550       memory              30324.87k
```

```
551        OS Memory           40560.00k
552        Timestamp           07/01/2024 06:40:05 AM
553        Step Count                        1  Switch Count  0
554        Page Faults                       0
555        Page Reclaims                     63
556        Page Swaps                        0
557        Voluntary Context Switches        1
558        Involuntary Context Switches      0
559        Block Input Operations            0
560        Block Output Operations           0
561
562
563
564  NOTE: DATA statement used (Total process time):
565        real time           0.00 seconds
566        user cpu time       0.00 seconds
567        system cpu time     0.00 seconds
568        memory              30324.87k
569        OS Memory           40560.00k
570        Timestamp           07/01/2024 06:40:05 AM
571        Step Count                        1  Switch Count  0
572        Page Faults                       0
573        Page Reclaims                     33
574        Page Swaps                        0
575        Voluntary Context Switches        0
576        Involuntary Context Switches      0
577        Block Input Operations            0
578        Block Output Operations           0
579
580
581
582  NOTE: DATA STEP view saved on file WORK.HPDMFOREST_TRAINDAT
       A.
583  NOTE: A stored DATA STEP view cannot run under a different
       operating system.
584  NOTE: DATA statement used (Total process time):
```

```
585        real time           0.00 seconds
586        user cpu time       0.00 seconds
587        system cpu time     0.00 seconds
588        memory              30324.87k
589        OS Memory           41848.00k
590        Timestamp           07/01/2024 06:40:05 AM
591        Step Count                       1  Switch Count  0
592        Page Faults                      0
593        Page Reclaims                    551
594        Page Swaps                       0
595        Voluntary Context Switches       8
596        Involuntary Context Switches     0
597        Block Input Operations           0
598        Block Output Operations          264
599
600
601  NOTE: PROCEDURE SQL used (Total process time):
602        real time           0.00 seconds
603        user cpu time       0.00 seconds
604        system cpu time     0.00 seconds
605        memory              32321.06k
606        OS Memory           45172.00k
607        Timestamp           07/01/2024 06:40:05 AM
608        Step Count                       1  Switch Count  0
609        Page Faults                      0
610        Page Reclaims                    311
611        Page Swaps                       0
612        Voluntary Context Switches       4
613        Involuntary Context Switches     0
614        Block Input Operations           0
615        Block Output Operations          0
616
617
618  NOTE: %INCLUDE (level 1) file TEMP is file SASHELP.HPDM.HPD
     MFOREST_MACROS.SOURCE.
619  16221 +%macro HPDM_HPFOREST(indata=,
```

```
620  16222 +                  target=,
621  16223 +                  targetOrder=,
622  16224 +                  alpha=,
623  16225 +                  catbins=,
624  16226 +                  exhaustive=,
625  16227 +                  leafsizemethod=,
626  16228 +                  leaffraction=,
627  16229 +                  leafsize=,
628  16230 +                  maxdepth=,
629  16231 +                  maxtrees=,
630  16232 +                  mincatsize=,
631  16233 +                  seed=,
632  16234 +                  splitsize=,
633  16235 +                  numobsmethod=,
634  16236 +                  trainfraction=,
635  16237 +                  trainn=,
636  16238 +                  vars_to_try=,
637  16239 +                  missing=,
638  16240 +                  minuseinsearch=,
639  16241 +                  out=,
640  16242 +                  outbase=,
641  16243 +                  outiter=,
642  16244 +                  outimport=
643  16245 +                  );
644  16247 +    /* retrieve files */
645  16248 +    %em_getname(key=OUTMDLFILE, type=FILE, extension
    =bin);
646  16250 +    data _null_;
647  16251 +        length foreststate foresthpstore $2000;
648  16252 +        foreststate   = "&EM_NODEDIR"!!"&em_dsep"!!"
    score.sasast";
649  16253 +        foresthpstore = "&EM_NODEDIR"!!"&em_dsep"!!"
    score.sas";
650  16254 +        call symput('FOREST_STATE', trim(foreststate
    ));
651  16255 +        call symput('FOREST_SCORE', trim(foresthpsto
```

```
    re));
652 16256 +    run;
653 16258 +    /* run the HPForest procedure */
654 16259 +    proc hpforest data=&indata
655 16261 +    /* HPForest arguments */
656 16262 +    %if &alpha ne %then %do;
657 16263 +      alpha=&alpha
658 16264 +    %end;
659 16265 +    %if &catbins ne %then %do;
660 16266 +      catbins=&catbins
661 16267 +    %end;
662 16268 +    %if &exhaustive ne %then %do;
663 16269 +      exhaustive=&exhaustive
664 16270 +    %end;
665 16271 +    %if &leafsizemethod ne DEFAULT %then %do;
666 16272 +      %if ((&leafsizemethod eq PERCENTAGE) and ("&le
    affraction" ne ".")) %then %do;
667 16273 +        leaffraction=&leaffraction
668 16274 +      %end;
669 16275 +      %else %if ((&leafsizemethod eq COUNT) and ("&l
    eafsize" ne ".")) %then %do;
670 16276 +        leafsize=&leafsize
671 16277 +      %end;
672 16278 +    %end;
673 16279 +    %if &maxdepth ne %then %do;
674 16280 +      maxdepth=&maxdepth
675 16281 +    %end;
676 16282 +    %if &maxtrees ne %then %do;
677 16283 +      maxtrees=&maxtrees
678 16284 +    %end;
679 16285 +    %if &mincatsize ne %then %do;
680 16286 +      mincatsize=&mincatsize
681 16287 +    %end;
682 16288 +    %if &missing ne %then %do;
683 16289 +      missing=&missing
684 16290 +      %if ((&missing eq USEINSEARCH) AND (&minuseins
```

```
    earch ne )) %then %do;
685 16291 +         minUseInSearch=&minuseinsearch
686 16292 +       %end;
687 16293 +    %end;
688 16294 +    %if &seed ne %then %do;
689 16295 +      seed=&seed
690 16296 +    %end;
691 16297 +    %if ((&splitsize ne) and ("&splitsize" ne ".")) 
    %then %do;
692 16298 +      splitsize=&splitsize
693 16299 +    %end;
694 16300 +    %if ((&numobsmethod eq PERCENTAGE) and ("&trainf
    raction" ne ".")) %then %do;
695 16301 +      trainfraction = &trainfraction
696 16302 +    %end;
697 16303 +    %else %if ((&numobsmethod eq COUNT) and ("&train
    n" ne ".")) %then %do;
698 16304 +       trainn = &trainn
699 16305 +    %end;
700 16306 +    %if ((&vars_to_try ne ) and ("&vars_to_try" ne "
    .")) %then %do;
701 16307 +       vars_to_try=&vars_to_try
702 16308 +    %end;
703 16309 +    %if %symexist(EM_HPFOREST_PROCSTMNT) %then %do;
704 16310 +       &EM_HPFOREST_PROCSTMNT
705 16311 +    %end;
706 16312 +    ;
707 16314 +    /* Input Statements */
708 16315 +    %if %EM_INTERVAL_INPUT %EM_INTERVAL_REJECTED ne
    %then %do;
709 16316 +      input %EM_INTERVAL_INPUT %EM_INTERVAL_REJECTED
    / level = interval;
710 16317 +    %end;
711 16319 +    %if %EM_BINARY_INPUT %EM_NOMINAL_INPUT %EM_BINAR
    Y_REJECTED %EM_NOMINAL_REJECTED ne  %then %do;
712 16320 +      input %EM_BINARY_INPUT %EM_BINARY_REJECTED %EM
```

```
    _NOMINAL_INPUT %EM_NOMINAL_REJECTED / level = nominal;
713 16321 +    %end;
714 16323 +    %if %EM_ORDINAL_INPUT %EM_ORDINAL_REJECTED ne %t
    hen %do;
715 16324 +      input %EM_ORDINAL_INPUT %EM_ORDINAL_REJECTED /
     level = ordinal;
716 16325 +    %end;
717 16327 +    /* Target Statement */
718 16328 +    * for the ordering of target levels;
719 16329 +    * if not ASC, FMTASC, or FMTDESC then alway use
    DESC;
720 16330 +    %if %EM_TARGET_LEVEL ne INTERVAL %then %do;
721 16331 +       %if &targetOrder eq ASC %then %let torder = %
    str(order = ASCENDING);
722 16332 +       %else %if &targetOrder eq FMTASC %then %let t
    order = %str(order = ASCFORMATTED);
723 16333 +       %else %if &targetOrder eq FMTDESC %then %let
    torder = %str(order = DESFORMATTED);
724 16334 +       %else %let torder = %str(order = DESCENDING);
725 16335 +    %end;
726 16336 +    %else %let torder=;
727 16338 +    target &Target / level = %EM_TARGET_LEVEL &torde
    r;
728 16340 +    %if &EM_NUM_KEY  %then %do;
729 16341 +       ID %EM_KEY ;
730 16342 +    %end;
731 16344 +    /* Partition variable */
732 16345 +    %if ("&hpdm_partitionVar" ne "") %then %do;
733 16346 +        partition rolevar=&hpdm_partitionVar(TRAIN='
    1' VALIDATE='0');
734 16347 +    %end;
735 16348 +    %else %if "&em_hpdm_train" ne "&indata" %then %d
    o;
736 16349 +       partition rolevar=_partInd_(TRAIN='1' VALIDAT
    E='0');
737 16350 +    %end;
```

```
738 16352 +    /* freq variable */
739 16353 +    %if %EM_FREQ ne %then %do;
740 16354 +      freq %EM_FREQ;
741 16355 +    %end;
742 16357 +    /* output statements */
743 16358 +    /*ods output nobs=&outnobs Baseline=&outbase Fit
    Statistics=&outiter ModelInfo=&outmodelparms timing=&outtim
    ing VariableImportance=&outimport; */
744 16359 +    ods output Baseline=&outbase FitStatistics=&outi
    ter VariableImportance=&outimport;
745 16361 +    /* Score Statement - Need to use ASTORE below to
     score instead when partitionVar exists so don't have to in
    clude partitionVar as ID */
746 16362 +    %if "&out" ne "" and "&EM_PROPERTY_MODELING" eq
    "Y" and "&hpdm_partitionVar" eq ""  %then %do;
747 16363 +      score out=&out
748 16364 +      %if %symexist(EM_HPFOREST_SCORESTMNT) %then %d
    o;
749 16365 +        &EM_HPFOREST_SCORESTMNT
750 16366 +      %end;
751 16367 +      ;
752 16368 +    %end;
753 16370 +    /* save statement */
754 16371 +    %if "&EM_PROPERTY_MODELING" eq "Y" or ("&EM_PROP
    ERTY_VARSELECT" eq "Y" and "&EM_PROPERTY_VIMETHOD" ne "LOSS
    REDUCTION") %then %do;
755 16372 +        save file="&EM_USER_OUTMDLFILE"
756 16373 +        %if %symexist(EM_HPFOREST_SAVESTMNT) %then %
    do;
757 16374 +          &EM_HPFOREST_SAVESTMNT
758 16375 +        %end;
759 16376 +        ;
760 16377 +    %end;
761 16379 +    savestate file = "&FOREST_STATE";
762 16380 +    /* Performance Statements */
763 16381 +    &hpdm_performance
```

```
764  16382 +      %if %symexist(EM_HPFOREST_PERFSTMNT) %then %do
     ;
765  16383 +         &EM_HPFOREST_PERFSTMNT
766  16384 +      %end;
767  16385 +    ;
768  16386 +    run;
769  16387 +    quit;
770  16389 +    proc astore;
771  16390 +        describe epcode="&FOREST_SCORE" store="&FORE
     ST_STATE";
772  16391 +        %if "&out" ne "" and "&EM_PROPERTY_MODELING"
      eq "Y" and "&hpdm_partitionVar" ne "" %then %do;
773  16392 +            /* scoring for HPDM assessment in place
     of using SCORE OUT= */
774  16393 +            score data=&indata store="&FOREST_STATE"
      copyvars=(&hpdm_partitionVar %em_key &Target) out=&out;
775  16394 +        %end;
776  16395 +    run;
777  16397 +%mend HPDM_HPFOREST;
778  NOTE: %INCLUDE (level 1) ending.
779  NOTE: Fileref TEMP has been deassigned.
780
781  NOTE: DATA statement used (Total process time):
782        real time           0.00 seconds
783        user cpu time       0.00 seconds
784        system cpu time     0.00 seconds
785        memory              32321.06k
786        OS Memory           45172.00k
787        Timestamp           07/01/2024 06:40:05 AM
788        Step Count                        1  Switch Count  0
789        Page Faults                       0
790        Page Reclaims                     30
791        Page Swaps                        0
792        Voluntary Context Switches        0
793        Involuntary Context Switches      0
794        Block Input Operations            0
```

```
795        Block Output Operations           0
796
797
798
799  NOTE: The HPFOREST procedure is executing in single-machine
       mode.
800  NOTE: Savestate successful. File "/home/u63452984/case-stud
     y-s2192852/Workspaces/EMWS3/HPDMForest/score.sasast" has be
     en written.
801  NOTE: The SAVESTATE statement succeeded.
802  NOTE: The number of threads actually used by PROC HPFOREST
     for parallel processing was 2.
803  NOTE: View WORK.HPDMFOREST_TRAINDATA.VIEW used (Total proce
     ss time):
804        real time           26.40 seconds
805        user cpu time       15.63 seconds
806        system cpu time     16.10 seconds
807        memory              599799.09k
808        OS Memory           648792.00k
809        Timestamp           07/01/2024 06:40:31 AM
810        Step Count                        1  Switch Count  5
811        Page Faults                       0
812        Page Reclaims                     153813
813        Page Swaps                        0
814        Voluntary Context Switches        1921771
815        Involuntary Context Switches      245
816        Block Input Operations            1280
817        Block Output Operations           442128
818
819  NOTE: There were 17497 observations read from the data set
     EMWS3.PART2_TRAIN.
820  NOTE: There were 7502 observations read from the data set E
     MWS3.PART2_VALIDATE.
821  NOTE: The data set EMWS3.HPDMFOREST_VARIMPORT has 6 observa
     tions and 8 variables.
822  NOTE: The data set EMWS3.HPDMFOREST_ITERATION has 100 obser
```

```
vations and 11 variables.
823 NOTE: The data set EMWS3.HPDMFOREST_BASELINE has 3 observat
ions and 3 variables.
824 NOTE: There were 24999 observations read from the data set
WORK.HPDMFOREST_TRAINDATA.
825 NOTE: The PROCEDURE HPFOREST printed page 4.
826 NOTE: PROCEDURE HPFOREST used (Total process time):
827       real time           26.48 seconds
828       user cpu time       15.64 seconds
829       system cpu time     16.15 seconds
830       memory              599799.09k
831       OS Memory           648792.00k
832       Timestamp           07/01/2024 06:40:31 AM
833       Step Count                        1  Switch Count  7
834       Page Faults                       0
835       Page Reclaims                     154158
836       Page Swaps                        0
837       Voluntary Context Switches        1921812
838       Involuntary Context Switches      245
839       Block Input Operations            1280
840       Block Output Operations           442896
841
842
843 NOTE: 971 bytes written to the code file "/home/u63452984/c
ase-study-s2192852/Workspaces/EMWS3/HPDMForest/score.sas"
844
845 NOTE: The PROCEDURE ASTORE printed page 5.
846 NOTE: PROCEDURE ASTORE used (Total process time):
847       real time           3.06 seconds
848       user cpu time       2.99 seconds
849       system cpu time     0.02 seconds
850       memory              599799.09k
851       OS Memory           648792.00k
852       Timestamp           07/01/2024 06:40:34 AM
853       Step Count                        1  Switch Count  0
854       Page Faults                       9
```

```
855       Page Reclaims                     118365
856       Page Swaps                        0
857       Voluntary Context Switches        1511
858       Involuntary Context Switches      25
859       Block Input Operations            219512
860       Block Output Operations           272
861
862
863
864  NOTE: Deleting WORK.HPDMFOREST_TRAINDATA (memtype=VIEW).
865
866  NOTE: PROCEDURE DATASETS used (Total process time):
867       real time           0.00 seconds
868       user cpu time       0.00 seconds
869       system cpu time     0.00 seconds
870       memory              599799.09k
871       OS Memory           648792.00k
872       Timestamp           07/01/2024 06:40:34 AM
873       Step Count                        1  Switch Count  0
874       Page Faults                       0
875       Page Reclaims                     57
876       Page Swaps                        0
877       Voluntary Context Switches        3
878       Involuntary Context Switches      0
879       Block Input Operations            0
880       Block Output Operations           8
881
882
883
884  NOTE: The data set WORK.EM_USER_MODEL has 1 observations an
      d 9 variables.
885  NOTE: DATA statement used (Total process time):
886       real time           0.00 seconds
887       user cpu time       0.00 seconds
888       system cpu time     0.00 seconds
889       memory              599799.09k
```

```
890        OS Memory           648792.00k
891        Timestamp           07/01/2024 06:40:34 AM
892        Step Count                       1  Switch Count  0
893        Page Faults                      0
894        Page Reclaims                    90
895        Page Swaps                       0
896        Voluntary Context Switches       0
897        Involuntary Context Switches     0
898        Block Input Operations           0
899        Block Output Operations          264
900
901
902  WARNING: Apparent symbolic reference EM_SCORE_OUTPUT not re
     solved.
903  WARNING: Apparent symbolic reference EM_SCORE_OUTPUT not re
     solved.
904
905  NOTE: The file FLOWREF is:
906        Filename=/home/u63452984/case-study-s2192852/Workspac
     es/EMWS3/HPDMForest/EMFLOWSCORE.sas,
907        Owner Name=u63452984,Group Name=oda,
908        Access Permission=-rw-r--r--,
909        Last Modified=07 January 2024 06:40:34
910
911  NOTE: 43 records were written to the file FLOWREF.
912        The minimum record length was 1.
913        The maximum record length was 114.
914  NOTE: There were 6 observations read from the data set EMWS
     3.HPDMFOREST_VARIABLESET.
915        WHERE ((ROLE='INPUT') and USE in ('D', 'Y')) or ((ROL
     E='REJECTED') and (USE='Y'));
916  NOTE: DATA statement used (Total process time):
917        real time           0.00 seconds
918        user cpu time       0.00 seconds
919        system cpu time     0.00 seconds
920        memory              599799.09k
```

```
      OS Memory           648792.00k
      Timestamp           07/01/2024 06:40:34 AM
      Step Count                        1  Switch Count  0
      Page Faults                       0
      Page Reclaims                     65
      Page Swaps                        0
      Voluntary Context Switches        9
      Involuntary Context Switches      0
      Block Input Operations            0
      Block Output Operations           8


NOTE: The file PUBREF is:
      Filename=/home/u63452984/case-study-s2192852/Workspac
es/EMWS3/HPDMForest/EMPUBLISHSCORE.sas,
      Owner Name=u63452984,Group Name=oda,
      Access Permission=-rw-r--r--,
      Last Modified=07 January 2024 06:40:34

NOTE: 31 records were written to the file PUBREF.
      The minimum record length was 1.
      The maximum record length was 120.
NOTE: DATA statement used (Total process time):
      real time           0.00 seconds
      user cpu time       0.01 seconds
      system cpu time     0.00 seconds
      memory              599799.09k
      OS Memory           648792.00k
      Timestamp           07/01/2024 06:40:35 AM
      Step Count                        1  Switch Count  0
      Page Faults                       0
      Page Reclaims                     29
      Page Swaps                        0
      Voluntary Context Switches        7
      Involuntary Context Switches      0
```

```
956        Block Input Operations            0
957        Block Output Operations           8
958
959
960  NOTE: Fileref PUBREF has been deassigned.
961  NOTE: Fileref FLOWREF has been deassigned.
962
963  NOTE: The file _HPDMFRF is:
964        Filename=/home/u63452984/case-study-s2192852/Workspac
     es/EMWS3/HPDMForest/HPDMSCORE.sas,
965        Owner Name=u63452984,Group Name=oda,
966        Access Permission=-rw-r--r--,
967        Last Modified=07 January 2024 06:40:35
968
969  NOTE: 1 record was written to the file _HPDMFRF.
970        The minimum record length was 1.
971        The maximum record length was 1.
972  NOTE: DATA statement used (Total process time):
973        real time           0.00 seconds
974        user cpu time       0.00 seconds
975        system cpu time     0.00 seconds
976        memory              599799.09k
977        OS Memory           648792.00k
978        Timestamp           07/01/2024 06:40:35 AM
979        Step Count                        1  Switch Count  0
980        Page Faults                       0
981        Page Reclaims                     27
982        Page Swaps                        0
983        Voluntary Context Switches        4
984        Involuntary Context Switches      0
985        Block Input Operations            0
986        Block Output Operations           8
987
988
989  NOTE: Fileref _HPDMFRF has been deassigned.
990  16399
```

```
 991 16400  *-------------------------------------------------
     ---------*;
 992 16401  * End TRAIN: HPDMForest;
 993 16402  *-------------------------------------------------
     ---------*;
 994
 995 16403  *-------------------------------------------------
     ---------*;
 996 16404  * Close any missing semi colons;
 997 16405  *-------------------------------------------------
     ---------*;
 998 16406  ;
 999 16407  ;
1000 16408  ;
1001 16409  ;
1002 16410  quit;
1003 16411  *-------------------------------------------------
     ---------*;
1004 16412  * Close any unbalanced quotes;
1005 16413  *-------------------------------------------------
     ---------*;
1006 16414  /*; *"; *'; */
1007 16415  ;
1008 16416  run;
1009 16417  quit;
1010 16418  /* Reset EM Options */
1011 16419  options formchar="|----|+|---+=|-/\<>*";
1012 16420  options nocenter ls=256 ps=10000;
1013 16421  goptions reset=all device=GIF NODISPLAY;
1014
1015 *-----------------------------------------------------
     --*
1016 * Score Log
1017 Date:                07 January 2024
1018 Time:                06:40:35
1019 *-----------------------------------------------------
```

```
     --*
1020 16523  %let EMEXCEPTIONSTRING=;
1021 16524  *-------------------------------------------------
     ---------*;
1022 16525  * SCORE: HPDMForest;
1023 16526  *-------------------------------------------------
     ---------*;
1024 16527  %let EM_ACTION = SCORE;
1025 16528  %let syscc = 0;
1026 16529  %macro main;
1027 16530
1028 16531     %if %upcase(&EM_ACTION) = CREATE %then %do;
1029 16532         filename temp catalog 'sashelp.hpdm.hpdmfores
     t_create.source';
1030 16533         %include temp;
1031 16534         filename temp;
1032 16535         %hpdm_Forest_create;
1033 16536     %end;
1034 16537     %else
1035 16538     %if %upcase(&EM_ACTION) = TRAIN %then %do;
1036 16539         filename temp catalog 'sashelp.hpdm.hpdmfores
     t_train.source';
1037 16540         %include temp;
1038 16541         filename temp;
1039 16542         %hpdm_Forest_train;
1040 16543     %end;
1041 16544     %else
1042 16545     %if %upcase(&EM_ACTION) = SCORE %then %do;
1043 16546         %em_checkmacro(name=EM_PROPERTY_VARSELECT, va
     lue=Y, global=Y);
1044 16547         %em_checkmacro(name=EM_PROPERTY_VIMETHOD, val
     ue=LOSSREDUCTION);
1045 16548          %if "&EM_PROPERTY_VARSELECT" eq "Y" and "&EM
     _PROPERTY_VIMETHOD" = "RBA" %then %do;
1046 16549              %em_getname(key=OUTMDLFILE, type=FILE, e
     xtension=bin);
```

```
1047 16550              %if %sysfunc(fileexist(&EM_USER_OUTMDLFI
     LE))=0 %then %do;
1048 16551                  /* when the Variable Importance meth
     od has changed to RBA after running with Use as Modeling=No
     , need to re-train to create the outmdl file */
1049 16552                  filename temp catalog 'sashelp.hpdm.h
     pdmforest_train.source';
1050 16553                  %include temp;
1051 16554                  filename temp;
1052 16555                  %hpdm_Forest_train;
1053 16556              %end;
1054 16557          %end;
1055 16558          filename temp catalog 'sashelp.hpdm.hpdmfore
     st_score.source';
1056 16559          %include temp;
1057 16560          filename temp;
1058 16561          %hpdm_Forest_score;
1059 16562     %end;
1060 16563     %else
1061 16564     %if %upcase(&EM_ACTION) = REPORT %then %do;
1062 16565         filename temp catalog 'sashelp.hpdm.hpdmfores
     t_report.source';
1063 16566         %include temp;
1064 16567         filename temp;
1065 16568         %hpdm_Forest_report;
1066 16569     %end;
1067 16570     %else
1068 16571
1069 16572  %mend main;
1070 16573
1071 16574  %main;
1072 NOTE: %INCLUDE (level 1) file TEMP is file SASHELP.HPDM.HPD
     MFOREST_SCORE.SOURCE.
1073 16575 +%Macro hpdm_Forest_score;
1074 16577 +   filename _cdt "&EM_FILE_CDELTA_TRAIN";
1075 16578 +   data _null_;
```

```
1076 16579 +     file _cdt;
1077 16580 +     put ' ';
1078 16581 +   run;
1079 16582 +   filename _cdt;
1080 16584 +   %em_checkmacro(name=EM_PROPERTY_VARSELECT, value=
     Y, global=Y);
1081 16585 +   %em_checkmacro(name=EM_PROPERTY_VIMETHOD, value=L
     OSSREDUCTION);
1082 16586 +   %em_checkmacro(name=EM_PROPERTY_RBATOPNUM, value=
     25);
1083 16587 +   %em_checkmacro(name=EM_PROPERTY_RBACUT, value=0.0
     1);
1084 16589 +   /* variable selection */
1085 16590 +   %if "&EM_PROPERTY_VARSELECT" eq "Y" %then %do;
1086 16592 +      %if &em_num_interval_Target %then %let rbameas
     ure = AAE;
1087 16593 +      %else %let rbameasure = Margin;
1088 16595 +      %EM_GETNAME(key=VARIMPORT);
1089 16597 +      %let measure=;
1090 16598 +      %let dsid = %sysfunc(open(&EM_USER_VARIMPORT))
     ;
1091 16599 +      %if "%EM_TARGET_LEVEL" eq "INTERVAL" %then %do
     ;
1092 16600 +         %let mnum = %sysfunc(varnum(&dsid, AAEValid
     ));
1093 16601 +         %if &mnum %then %let measure = AAEValid;
1094 16602 +         %else %do;
1095 16603 +            %let mnum = %sysfunc(varnum(&dsid, AAEOO
     B));
1096 16604 +            %if &mnum %then %let measure = AAEOOB;
1097 16605 +         %end;
1098 16606 +      %end;
1099 16607 +      %else %do;
1100 16608 +         %let mnum = %sysfunc(varnum(&dsid, MarginVa
     lid));
1101 16609 +         %if &mnum %then %let measure = MarginValid;
```

```
1102  16610 +         %else %do;
1103  16611 +            %let mnum = %sysfunc(varnum(&dsid, MARGI
      NOOB));
1104  16612 +            %if &mnum %then %let measure = MARGINOOB
      ;
1105  16613 +         %end;
1106  16614 +      %end;
1107  16615 +      %if &dsid %then %let dsid=%sysfunc(close(&dsid
      ));
1108  16617 +      %if %length(&measure) %then %do;
1109  16618 +         /* loss reduction */
1110  16619 +         %if "&EM_PROPERTY_VIMETHOD" = "LOSSREDUCTIO
      N" %then %do;
1111  16621 +            %let dsid = %sysfunc(open(&EM_USER_VARIM
      PORT(where=(&measure le 0))));
1112  16622 +            %let varnum = %sysfunc(varnum(&dsid, var
      iable));
1113  16623 +            /* check for RBA columns from previous r
      un */
1114  16624 +            %let rbavarnum = %sysfunc(varnum(&dsid,M
      SERBA));
1115  16625 +            %let obs = %sysfunc(fetch(&dsid));
1116  16626 +            %do %while(&obs=0);
1117  16627 +               %let temp = %nrbquote(%sysfunc(getvar
      c(&dsid, &varnum)));
1118  16628 +               %let varname = %nrbquote(%sysfunc(tra
      nwrd(&temp,  %str(%"),"")));
1119  16629 +               %EM_METACHANGE(name=&varname, role=RE
      JECTED);
1120  16630 +               %let obs = %sysfunc(fetch(&dsid));
1121  16631 +            %end;
1122  16632 +            %if &dsid %then %let dsid=%sysfunc(close
      (&dsid));
1123  16634 +            %if &rbavarnum %then %do;
1124  16635 +               data &EM_USER_VARIMPORT;
1125  16636 +                  set &EM_USER_VARIMPORT;
```

```
1126 16637 +                  drop mserba &rbameasure.rba label;
1127 16638 +               run;
1128 16639 +            %end;
1129 16641 +         %end;
1130 16643 +         %else %do;/* RBA */
1131 16644 +            /*
1132 16645 +               reject the variables that didn't make
      cut for hp4score - do this even if less inputs than RBATOP
     NUM
1133 16646 +               to get them in importance order
1134 16647 +            */
1135 16648 +            proc sort data=&EM_USER_VARIMPORT out=VA
     RIMP;
1136 16649 +               by descending &measure;
1137 16650 +            run;
1138 16652 +            data varimp;
1139 16653 +               set varimp(obs=&EM_PROPERTY_RBATOPNUM
     );
1140 16654 +            run;
1141 16656 +            %em_varmacro(name=em_rba_input, metadata
     =VARIMP, key=variable);
1142 16658 +            %em_getname(key=OUTMDLFILE, type=FILE, e
     xtension=bin);
1143 16660 +            %if %symexist(em_hpdm_train)=0 %then %do
     ;
1144 16661 +               %hpdm_dataprep(data=, out=, metadata=
     _exportMeta, code=, ROLE=TRAIN, append=Y);
1145 16662 +            %end;
1146 16664 +            %let validflag = 0;
1147 16665 +            %if "&em_hpdm_train" eq "&em_import_data
     " %then %do;
1148 16666 +               /* data not on grid - use validation
     data if available */
1149 16667 +               %if ("&EM_IMPORT_VALIDATE" ne "") and
      (%sysfunc(exist(&em_import_validate)) or %sysfunc(exist(&e
     m_import_validate, VIEW))) %then %do;
```

```
1150 16668 +                  %let data_rba = &em_import_validat
     e;
1151 16669 +                  %let validflag = 1;
1152 16670 +               %end;
1153 16671 +               %else %let data_rba = &em_import_data
     ;
1154 16672 +            %end;
1155 16673 +            %else %let data_rba = &em_hpdm_train;
1156 16675 +            ods output VariableImportance=work.VIRBA
     ;
1157 16676 +            proc hp4score data=&data_rba;
1158 16677 +                /* Use validation data when partitio
     nVar exists on grid */
1159 16678 +                %if "&em_hpdm_train" ne "&em_import_
     data" and "&hpdm_partitionVar" ne "" %then %do;
1160 16679 +                   where &hpdm_partitionVar=0;
1161 16680 +                   %let validflag = 1;
1162 16681 +                %end;
1163 16682 +               importance file="&EM_USER_OUTMDLFILE"
      vars=(%em_rba_input) maxdepth=6 %if &validflag %then role=
     VALID;;
1164 16683 +               %if %symexist(EM_HPFOREST_RBANTHREADS
     1) %then %do;
1165 16684 +                  %if %qupcase(&EM_HPFOREST_RBANTHRE
     ADS1)=%str(Y) %then %do;
1166 16685 +                     performance nthreads=1;
1167 16686 +                  %end;
1168 16687 +                  %else %do;
1169 16688 +                     &hpdm_performance;
1170 16689 +                  %end;
1171 16690 +               %end;
1172 16691 +               %else %do;
1173 16692 +                  &hpdm_performance;
1174 16693 +               %end;
1175 16694 +            run;
1176 16696 +            %if %sysfunc(exist(VIRBA)) %then %do;
```

```
1177 16698 +               /* merge with other var imp table so
     all measures in a single table for results */
1178 16699 +               /* need to have drop in case they are
      in there from previous run */
1179 16700 +               proc sort data=&EM_USER_VARIMPORT out
     =vi1(drop=&rbameasure.rba mserba label);
1180 16701 +                  by variable;
1181 16702 +               run;
1182 16704 +               proc sort data=virba;
1183 16705 +                  by variable;
1184 16706 +               run;
1185 16708 +               data &EM_USER_VARIMPORT;
1186 16709 +                  merge vi1 virba(rename=(&rbameasur
     e=&rbameasure.RBA mse=MSERBA));
1187 16710 +                  by variable;
1188 16711 +               run;
1189 16713 +               proc sql noprint;
1190 16714 +                 select max(&rbameasure) format=best
     12. into :rbamax trimmed from virba;
1191 16715 +               quit;
1192 16717 +               %let minvi = %sysevalf(&rbamax * &EM_
     PROPERTY_RBACUT);
1193 16718 +               %put max of &rbameasure is &rbamax;
1194 16720 +               filename dlttemp "&EM_FILE_CDELTA_TRA
     IN";
1195 16722 +                data _null_;
1196 16723 +                   length varname $64 string $200 ;
1197 16724 +                   file dlttemp;
1198 16725 +                   set &EM_USER_VARIMPORT;
1199 16726 +                   if &rbameasure.RBA < &minvi then
     do;
1200 16727 +                      varname = tranwrd(variable, '
     "', '""');
1201 16728 +                      string = 'if upcase(name) eq
     "'!!upcase(trim(varname))!!'"'!!' then ROLE="REJECTED";';
1202 16729 +                      put string;
```

```
1203  16730 +                    end;
1204  16731 +                 run;
1205  16733 +                 filename dlttemp;
1206  16734 +              %end;
1207  16736 +           %end; /* end RBA */
1208  16738 +        %end;
1209  16740 +   %end;
1210  16742 +%Mend hpdm_Forest_score;
1211  NOTE: %INCLUDE (level 1) ending.
1212  NOTE: Fileref TEMP has been deassigned.
1213
1214  NOTE: The file _CDT is:
1215        Filename=/home/u63452984/case-study-s2192852/Workspac
      es/EMWS3/HPDMForest/CDELTA_TRAIN.sas,
1216        Owner Name=u63452984,Group Name=oda,
1217        Access Permission=-rw-r--r--,
1218        Last Modified=07 January 2024 06:40:35
1219
1220  NOTE: 1 record was written to the file _CDT.
1221        The minimum record length was 1.
1222        The maximum record length was 1.
1223  NOTE: DATA statement used (Total process time):
1224        real time           0.00 seconds
1225        user cpu time       0.00 seconds
1226        system cpu time     0.00 seconds
1227        memory              599799.09k
1228        OS Memory           648792.00k
1229        Timestamp           07/01/2024 06:40:35 AM
1230        Step Count                        1  Switch Count  0
1231        Page Faults                       0
1232        Page Reclaims                     28
1233        Page Swaps                        0
1234        Voluntary Context Switches        5
1235        Involuntary Context Switches      0
1236        Block Input Operations            0
1237        Block Output Operations           8
```

```
1238
1239
1240 NOTE: Fileref _CDT has been deassigned.
1241
1242 NOTE: The data set WORK.EM_METACHANGE has 1 observations an
     d 9 variables.
1243 NOTE: DATA statement used (Total process time):
1244       real time           0.00 seconds
1245       user cpu time       0.00 seconds
1246       system cpu time     0.00 seconds
1247       memory              599799.09k
1248       OS Memory           648792.00k
1249       Timestamp           07/01/2024 06:40:35 AM
1250       Step Count                        1  Switch Count  0
1251       Page Faults                       0
1252       Page Reclaims                     92
1253       Page Swaps                        0
1254       Voluntary Context Switches        0
1255       Involuntary Context Switches      0
1256       Block Input Operations            0
1257       Block Output Operations           264
1258
1259
1260
1261 NOTE: There were 1 observations read from the data set WORK
     .EM_METACHANGE.
1262 NOTE: The data set WORK.EM_METACHANGE has 2 observations an
     d 9 variables.
1263 NOTE: DATA statement used (Total process time):
1264       real time           0.00 seconds
1265       user cpu time       0.01 seconds
1266       system cpu time     0.00 seconds
1267       memory              599799.09k
1268       OS Memory           648792.00k
1269       Timestamp           07/01/2024 06:40:35 AM
1270       Step Count                        1  Switch Count  0
```

```
1271        Page Faults                          0
1272        Page Reclaims                        128
1273        Page Swaps                           0
1274        Voluntary Context Switches           0
1275        Involuntary Context Switches         0
1276        Block Input Operations               0
1277        Block Output Operations              264
1278
1279
1280  16747
1281  16748  *-------------------------------------------------
      ---------*;
1282  16749  * End SCORE: HPDMForest;
1283  16750  *-------------------------------------------------
      ---------*;
1284
1285  16751  proc sort data=WORK.EM_METACHANGE;
1286  16752  by key uname;
1287  16753  run;
1288
1289  NOTE: There were 2 observations read from the data set WORK
      .EM_METACHANGE.
1290  NOTE: The data set WORK.EM_METACHANGE has 2 observations an
      d 9 variables.
1291  NOTE: PROCEDURE SORT used (Total process time):
1292        real time            0.00 seconds
1293        user cpu time        0.00 seconds
1294        system cpu time      0.00 seconds
1295        memory               599799.09k
1296        OS Memory            648792.00k
1297        Timestamp            07/01/2024 06:40:35 AM
1298        Step Count                        1  Switch Count  0
1299        Page Faults                       0
1300        Page Reclaims                     122
1301        Page Swaps                        0
1302        Voluntary Context Switches        0
```

```
1303        Involuntary Context Switches      0
1304        Block Input Operations            0
1305        Block Output Operations           264
1306
1307
1308  16754  filename x "/home/u63452984/case-study-s2192852/Work
      spaces/EMWS3/HPDMForest/CDELTA_TRAIN.sas";
1309  16755  data _null_;
1310  16756  file x;
1311  16757  put 'if upcase(NAME) = "AGE" then do;';
1312  16758  put 'ROLE = "REJECTED";';
1313  16759  put 'end;';
1314  16760  put 'else ';
1315  16761  put 'if upcase(NAME) = "M_VARIABLE" then do;';
1316  16762  put 'ROLE = "REJECTED";';
1317  16763  put 'end;';
1318  16764  run;
1319
1320  NOTE: The file X is:
1321        Filename=/home/u63452984/case-study-s2192852/Workspac
      es/EMWS3/HPDMForest/CDELTA_TRAIN.sas,
1322        Owner Name=u63452984,Group Name=oda,
1323        Access Permission=-rw-r--r--,
1324        Last Modified=07 January 2024 06:40:35
1325
1326  NOTE: 7 records were written to the file X.
1327        The minimum record length was 4.
1328        The maximum record length was 39.
1329  NOTE: DATA statement used (Total process time):
1330        real time           0.00 seconds
1331        user cpu time       0.00 seconds
1332        system cpu time     0.00 seconds
1333        memory              599799.09k
1334        OS Memory           648792.00k
1335        Timestamp           07/01/2024 06:40:35 AM
1336        Step Count                        1  Switch Count  0
```

```
1337        Page Faults                          0
1338        Page Reclaims                        29
1339        Page Swaps                           0
1340        Voluntary Context Switches           5
1341        Involuntary Context Switches         0
1342        Block Input Operations               0
1343        Block Output Operations              8
1344
1345
1346  16765  filename x;
1347  NOTE: Fileref X has been deassigned.
1348
1349  16766  filename _emscr "/home/u63452984/case-study-s2192852
      /Workspaces/EMWS3/HPDMForest/EMFLOWSCORE.sas";
1350  16767  %let em_score_output = _ScoreTrain;
1351  16768  data _ScoreTrain;
1352  16769  set EMWS3.Part2_TRAIN;
1353  16770  run;
1354
1355  NOTE: There were 17497 observations read from the data set
      EMWS3.PART2_TRAIN.
1356  NOTE: The data set WORK._SCORETRAIN has 17497 observations
      and 10 variables.
1357  NOTE: DATA statement used (Total process time):
1358        real time            0.00 seconds
1359        user cpu time        0.00 seconds
1360        system cpu time      0.00 seconds
1361        memory               599799.09k
1362        OS Memory            648792.00k
1363        Timestamp            07/01/2024 06:40:35 AM
1364        Step Count                        1  Switch Count  0
1365        Page Faults                       0
1366        Page Reclaims                     569
1367        Page Swaps                        0
1368        Voluntary Context Switches        4
1369        Involuntary Context Switches      0
```

```
1370       Block Input Operations            0
1371       Block Output Operations           3080
1372
1373
1374 16771  %inc _emscr;
1375 NOTE: %INCLUDE (level 1) file _EMSCR is file /home/u6345298
     4/case-study-s2192852/Workspaces/EMWS3/HPDMForest/EMFLOWSCO
     RE.sas.
1376 16772 +%macro em_hpfst_score;
1377 16773 +
1378 16774 +  %if %sysfunc(exist(work._score_temp)) %then %do;
1379 16775 +     proc delete data=work._score_temp;
1380 16776 +     run;
1381 16777 +  %end;
1382 16778 +
1383 16779 +  %if %symexist(hpfst_score_input)=0 %then %let hpfs
     t_score_input=&em_score_output;
1384 16780 +  %if %symexist(hpfst_score_output)=0 %then %let hpf
     st_score_output=&em_score_output;
1385 16781 +
1386 16782 +%let hpvvn= %sysfunc(getoption(VALIDVARNAME));
1387 16783 +options validvarname=V7;
1388 16784 +  proc hp4score data=&hpfst_score_input(keep=
1389 16785 +Age
1390 16786 +IMP_TotalSpent
1391 16787 +M_Variable
1392 16788 +MembershipLevel
1393 16789 +PaymentMethod
1394 16790 +TotalPurchases
1395 16791 +  );
1396 16792 +  %if %symexist(EM_USER_OUTMDLFILE)=0 %then %do;
1397 16793 +    score file="/home/u63452984/case-study-s2192852/
     Workspaces/EMWS3/HPDMForest/OUTMDLFILE.bin" out=work._outte
     mp;
1398 16794 +  %end;
1399 16795 +  %else %do;
```

```
1400  16796 +    score file="&EM_USER_OUTMDLFILE" out=work._outte
      mp;
1401  16797 +  %end;
1402  16798 +    PERFORMANCE  DETAILS nthreads=1;
1403  16799 +  run;
1404  16800 +
1405  16801 +options validvarname=&hpvvn;
1406  16802 +  data work._score_temp;
1407  16803 +     merge &hpfst_score_input work._outtemp;
1408  16804 +  run;
1409  16805 +
1410  16806 +  proc delete data=work._outtemp;
1411  16807 +  run;
1412  16808 +
1413  16809 +  data &hpfst_score_output;
1414  16810 +    set work._score_temp;
1415  16811 +%mend;
1416  16812 +
1417  16813 +%symdel hpfst_score_input hpfst_score_output EM_USER
      _OUTMDLFILE/nowarn;
1418  16814 +%em_hpfst_score;
1419
1420  NOTE: The HP4SCORE procedure is executing in single-machine
       mode.
1421  NOTE: There were 17497 observations read from the data set
      WORK._SCORETRAIN.
1422  NOTE: The data set WORK._OUTTEMP has 17497 observations and
       4 variables.
1423  NOTE: The PROCEDURE HP4SCORE printed page 6.
1424  NOTE: PROCEDURE HP4SCORE used (Total process time):
1425        real time           2.38 seconds
1426        user cpu time       2.16 seconds
1427        system cpu time     0.20 seconds
1428        memory              599799.09k
1429        OS Memory           648792.00k
1430        Timestamp           07/01/2024 06:40:37 AM
```

```
1431       Step Count                         1  Switch Count  0
1432       Page Faults                        1
1433       Page Reclaims                      64216
1434       Page Swaps                         0
1435       Voluntary Context Switches         828
1436       Involuntary Context Switches       7
1437       Block Input Operations             219568
1438       Block Output Operations            1040
1439
1440
1441
1442 NOTE: There were 17497 observations read from the data set
     WORK._SCORETRAIN.
1443 NOTE: There were 17497 observations read from the data set
     WORK._OUTTEMP.
1444 NOTE: The data set WORK._SCORE_TEMP has 17497 observations
     and 14 variables.
1445 NOTE: DATA statement used (Total process time):
1446       real time           0.00 seconds
1447       user cpu time       0.01 seconds
1448       system cpu time     0.00 seconds
1449       memory              599799.09k
1450       OS Memory           648792.00k
1451       Timestamp           07/01/2024 06:40:37 AM
1452       Step Count                         1  Switch Count  0
1453       Page Faults                        0
1454       Page Reclaims                      669
1455       Page Swaps                         0
1456       Voluntary Context Switches         0
1457       Involuntary Context Switches       0
1458       Block Input Operations             0
1459       Block Output Operations            3592
1460
1461
1462
1463 NOTE: Deleting WORK._OUTTEMP (memtype=DATA).
```

```
1464 NOTE: PROCEDURE DELETE used (Total process time):
1465       real time           0.00 seconds
1466       user cpu time       0.00 seconds
1467       system cpu time     0.00 seconds
1468       memory              599799.09k
1469       OS Memory           648792.00k
1470       Timestamp           07/01/2024 06:40:37 AM
1471       Step Count                        1  Switch Count  0
1472       Page Faults                       0
1473       Page Reclaims                     21
1474       Page Swaps                        0
1475       Voluntary Context Switches        0
1476       Involuntary Context Switches      0
1477       Block Input Operations            0
1478       Block Output Operations           0
1479
1480
1481 NOTE: %INCLUDE (level 1) ending.
1482 16815  run;
1483
1484 NOTE: There were 17497 observations read from the data set
     WORK._SCORE_TEMP.
1485 NOTE: The data set WORK._SCORETRAIN has 17497 observations
     and 14 variables.
1486 NOTE: DATA statement used (Total process time):
1487       real time           0.00 seconds
1488       user cpu time       0.00 seconds
1489       system cpu time     0.00 seconds
1490       memory              599799.09k
1491       OS Memory           648792.00k
1492       Timestamp           07/01/2024 06:40:37 AM
1493       Step Count                        1  Switch Count  0
1494       Page Faults                       0
1495       Page Reclaims                     535
1496       Page Swaps                        0
1497       Voluntary Context Switches        1
```

```
1498        Involuntary Context Switches      0
1499        Block Input Operations            0
1500        Block Output Operations           3592
1501
1502
1503  16816  filename _emscr;
1504  NOTE: Fileref _EMSCR has been deassigned.
1505
1506  16817  data _null_;
1507  16818  set EMWS3.HPDMForest_IMP_Churn_DM;
1508  16819  where _TYPE_ in('MATRIX', 'DECPRIOR');
1509  16820  select(_TYPE_);
1510  16821  when('MATRIX') call symput('useDec', strip(use));
1511  16822  when('DECPRIOR') call symput('usePrior', strip(use))
      ;
1512  16823  otherwise;
1513  16824  end;
1514  16825  run;
1515
1516  NOTE: There were 2 observations read from the data set EMWS
      3.HPDMFOREST_IMP_CHURN_DM.
1517        WHERE _TYPE_ in ('DECPRIOR', 'MATRIX');
1518  NOTE: DATA statement used (Total process time):
1519        real time           0.00 seconds
1520        user cpu time       0.00 seconds
1521        system cpu time     0.00 seconds
1522        memory              599799.09k
1523        OS Memory           648792.00k
1524        Timestamp           07/01/2024 06:40:37 AM
1525        Step Count                        1  Switch Count  0
1526        Page Faults                       0
1527        Page Reclaims                     64
1528        Page Swaps                        0
1529        Voluntary Context Switches        5
1530        Involuntary Context Switches      0
1531        Block Input Operations            0
```

```
1532       Block Output Operations          0
1533
1534
1535 16826  filename _emscr "/home/u63452984/case-study-s2192852
     /Workspaces/EMWS3/HPDMForest/EMFLOWSCORE.sas" MOD;
1536 16827  %makeClassificationVars(target=IMP_Churn, data=_Scor
     eTrain, decmeta=EMWS3.HPDMForest_IMP_Churn_DM, intoVar=Y, p
     ublish=N, fref=_emscr);
1537
1538 NOTE: There were 2 observations read from the data set EMWS
     3.HPDMFOREST_IMP_CHURN_DM.
1539       WHERE _TYPE_='PREDICTED';
1540 NOTE: DATA statement used (Total process time):
1541       real time           0.00 seconds
1542       user cpu time       0.00 seconds
1543       system cpu time     0.00 seconds
1544       memory              599799.09k
1545       OS Memory           648792.00k
1546       Timestamp           07/01/2024 06:40:37 AM
1547       Step Count                       1  Switch Count  0
1548       Page Faults                      0
1549       Page Reclaims                    62
1550       Page Swaps                       0
1551       Voluntary Context Switches       1
1552       Involuntary Context Switches     0
1553       Block Input Operations           0
1554       Block Output Operations          0
1555
1556
1557
1558 NOTE: There were 2 observations read from the data set EMWS
     3.HPDMFOREST_IMP_CHURN_DM.
1559       WHERE _TYPE_ in ('FROM', 'INTO');
1560 NOTE: DATA statement used (Total process time):
1561       real time           0.00 seconds
1562       user cpu time       0.00 seconds
```

```
1563        system cpu time     0.00 seconds
1564        memory              599799.09k
1565        OS Memory           648792.00k
1566        Timestamp           07/01/2024 06:40:37 AM
1567        Step Count                        1  Switch Count  0
1568        Page Faults                       0
1569        Page Reclaims                     63
1570        Page Swaps                        0
1571        Voluntary Context Switches        1
1572        Involuntary Context Switches      0
1573        Block Input Operations            0
1574        Block Output Operations           0
1575
1576
1577
1578 NOTE: There were 0 observations read from the data set SASH
     ELP.VFORMAT.
1579        WHERE UPCASE(fmtname)='BEST12';
1580 NOTE: DATA statement used (Total process time):
1581        real time           0.02 seconds
1582        user cpu time       0.03 seconds
1583        system cpu time     0.00 seconds
1584        memory              599799.09k
1585        OS Memory           648792.00k
1586        Timestamp           07/01/2024 06:40:37 AM
1587        Step Count                        1  Switch Count  0
1588        Page Faults                       0
1589        Page Reclaims                     2119
1590        Page Swaps                        0
1591        Voluntary Context Switches        0
1592        Involuntary Context Switches      2
1593        Block Input Operations            0
1594        Block Output Operations           0
1595
1596
1597
```

```
1598 NOTE: The file _EMSCR is:
1599       Filename=/home/u63452984/case-study-s2192852/Workspac
     es/EMWS3/HPDMForest/EMFLOWSCORE.sas,
1600       Owner Name=u63452984,Group Name=oda,
1601       Access Permission=-rw-r--r--,
1602       Last Modified=07 January 2024 06:40:34,
1603       File Size (bytes)=1105
1604
1605 NOTE: 29 records were written to the file _EMSCR.
1606       The minimum record length was 4.
1607       The maximum record length was 63.
1608 NOTE: DATA statement used (Total process time):
1609       real time           0.00 seconds
1610       user cpu time       0.00 seconds
1611       system cpu time     0.00 seconds
1612       memory              599799.09k
1613       OS Memory           648792.00k
1614       Timestamp           07/01/2024 06:40:37 AM
1615       Step Count                        1  Switch Count  0
1616       Page Faults                       0
1617       Page Reclaims                     37
1618       Page Swaps                        0
1619       Voluntary Context Switches        4
1620       Involuntary Context Switches      0
1621       Block Input Operations            0
1622       Block Output Operations           16
1623
1624
1625 16828  filename _emscr;
1626 NOTE: Fileref _EMSCR has been deassigned.
1627
1628 16829  filename _emscr "/home/u63452984/case-study-s2192852
     /Workspaces/EMWS3/HPDMForest/POSTEPSCORECODE.sas" MOD;
1629 16830  %makeClassificationVars(target=IMP_Churn, data=_Scor
     eTrain, decmeta=EMWS3.HPDMForest_IMP_Churn_DM, intoVar=Y, p
     ublish=Y, fref=_emscr);
```

```
1630
1631 NOTE: There were 2 observations read from the data set EMWS
     3.HPDMFOREST_IMP_CHURN_DM.
1632       WHERE _TYPE_='PREDICTED';
1633 NOTE: DATA statement used (Total process time):
1634       real time           0.00 seconds
1635       user cpu time       0.00 seconds
1636       system cpu time     0.00 seconds
1637       memory              599799.09k
1638       OS Memory           648792.00k
1639       Timestamp           07/01/2024 06:40:37 AM
1640       Step Count                        1  Switch Count  0
1641       Page Faults                       0
1642       Page Reclaims                     66
1643       Page Swaps                        0
1644       Voluntary Context Switches        1
1645       Involuntary Context Switches      0
1646       Block Input Operations            0
1647       Block Output Operations           8
1648
1649
1650
1651 NOTE: There were 2 observations read from the data set EMWS
     3.HPDMFOREST_IMP_CHURN_DM.
1652       WHERE _TYPE_ in ('FROM', 'INTO');
1653 NOTE: DATA statement used (Total process time):
1654       real time           0.00 seconds
1655       user cpu time       0.00 seconds
1656       system cpu time     0.00 seconds
1657       memory              599799.09k
1658       OS Memory           648792.00k
1659       Timestamp           07/01/2024 06:40:37 AM
1660       Step Count                        1  Switch Count  0
1661       Page Faults                       0
1662       Page Reclaims                     63
1663       Page Swaps                        0
```

```
1664        Voluntary Context Switches        1
1665        Involuntary Context Switches      0
1666        Block Input Operations            0
1667        Block Output Operations           0
1668
1669
1670
1671  NOTE: There were 0 observations read from the data set SASH
      ELP.VFORMAT.
1672         WHERE UPCASE(fmtname)='BEST12';
1673  NOTE: DATA statement used (Total process time):
1674        real time           0.02 seconds
1675        user cpu time       0.03 seconds
1676        system cpu time     0.00 seconds
1677        memory              599799.09k
1678        OS Memory           648792.00k
1679        Timestamp           07/01/2024 06:40:37 AM
1680        Step Count                        1  Switch Count  0
1681        Page Faults                       0
1682        Page Reclaims                     1932
1683        Page Swaps                        0
1684        Voluntary Context Switches        0
1685        Involuntary Context Switches      2
1686        Block Input Operations            0
1687        Block Output Operations           0
1688
1689
1690
1691  NOTE: The file _EMSCR is:
1692        Filename=/home/u63452984/case-study-s2192852/Workspac
      es/EMWS3/HPDMForest/POSTEPSCORECODE.sas,
1693        Owner Name=u63452984,Group Name=oda,
1694        Access Permission=-rw-r--r--,
1695        Last Modified=07 January 2024 06:40:37,
1696        File Size (bytes)=0
1697
```

```
1698 NOTE: 25 records were written to the file _EMSCR.
1699       The minimum record length was 4.
1700       The maximum record length was 63.
1701 NOTE: DATA statement used (Total process time):
1702       real time           0.00 seconds
1703       user cpu time       0.00 seconds
1704       system cpu time     0.00 seconds
1705       memory              599799.09k
1706       OS Memory           648792.00k
1707       Timestamp           07/01/2024 06:40:37 AM
1708       Step Count                        1  Switch Count  0
1709       Page Faults                       0
1710       Page Reclaims                     31
1711       Page Swaps                        0
1712       Voluntary Context Switches        3
1713       Involuntary Context Switches      0
1714       Block Input Operations            0
1715       Block Output Operations           8
1716
1717
1718 16831  filename _emscr;
1719 NOTE: Fileref _EMSCR has been deassigned.
1720
1721 16832  filename _f1 "/home/u63452984/case-study-s2192852/Wo
     rkspaces/EMWS3/HPDMForest/POSTEPSCORECODE.sas";
1722 16833  filename _f2 "/home/u63452984/case-study-s2192852/Wo
     rkspaces/EMWS3/HPDMForest/EMPUBLISHSCORE.sas";
1723 16834  %em_copyfile(infref=_f1, outfref=_f2, append=Y);
1724
1725 NOTE: The file _F2 is:
1726       Filename=/home/u63452984/case-study-s2192852/Workspac
     es/EMWS3/HPDMForest/EMPUBLISHSCORE.sas,
1727       Owner Name=u63452984,Group Name=oda,
1728       Access Permission=-rw-r--r--,
1729       Last Modified=07 January 2024 06:40:34,
1730       File Size (bytes)=987
```

```
1731
1732 NOTE: 25 records were written to the file _F2.
1733       The minimum record length was 4.
1734       The maximum record length was 63.
1735 NOTE: DATA statement used (Total process time):
1736       real time           0.00 seconds
1737       user cpu time       0.00 seconds
1738       system cpu time     0.00 seconds
1739       memory              599799.09k
1740       OS Memory           648792.00k
1741       Timestamp           07/01/2024 06:40:37 AM
1742       Step Count                        1  Switch Count  0
1743       Page Faults                       0
1744       Page Reclaims                     28
1745       Page Swaps                        0
1746       Voluntary Context Switches        7
1747       Involuntary Context Switches      0
1748       Block Input Operations            0
1749       Block Output Operations           8
1750
1751
1752 16835  filename _f1;
1753 NOTE: Fileref _F1 has been deassigned.
1754 16836  filename _f2;
1755 NOTE: Fileref _F2 has been deassigned.
1756
1757 16837  filename _emscr "/home/u63452984/case-study-s2192852
     /Workspaces/EMWS3/HPDMForest/EMFLOWSCORE.sas" MOD;
1758 16838  %makeResidualVars(target=IMP_Churn, decmeta=EMWS3.HP
     DMForest_IMP_Churn_DM, fref=_emscr);
1759
1760 NOTE: There were 2 observations read from the data set EMWS
     3.HPDMFOREST_IMP_CHURN_DM.
1761       WHERE _TYPE_ in ('FROM', 'TARGET');
1762 NOTE: DATA statement used (Total process time):
1763       real time           0.00 seconds
```

```
1764        user cpu time       0.00 seconds
1765        system cpu time     0.00 seconds
1766        memory              599799.09k
1767        OS Memory           648792.00k
1768        Timestamp           07/01/2024 06:40:37 AM
1769        Step Count                        1  Switch Count  0
1770        Page Faults                       0
1771        Page Reclaims                     60
1772        Page Swaps                        0
1773        Voluntary Context Switches        1
1774        Involuntary Context Switches      0
1775        Block Input Operations            0
1776        Block Output Operations           0
1777
1778
1779
1780 NOTE: There were 2 observations read from the data set EMWS
     3.HPDMFOREST_IMP_CHURN_DM.
1781        WHERE _TYPE_='PREDICTED';
1782 NOTE: DATA statement used (Total process time):
1783        real time           0.00 seconds
1784        user cpu time       0.00 seconds
1785        system cpu time     0.00 seconds
1786        memory              599799.09k
1787        OS Memory           648792.00k
1788        Timestamp           07/01/2024 06:40:37 AM
1789        Step Count                        1  Switch Count  0
1790        Page Faults                       0
1791        Page Reclaims                     62
1792        Page Swaps                        0
1793        Voluntary Context Switches        1
1794        Involuntary Context Switches      0
1795        Block Input Operations            0
1796        Block Output Operations           0
1797
1798
```

```
1799
1800 NOTE: There were 2 observations read from the data set EMWS
     3.HPDMFOREST_IMP_CHURN_DM.
1801       WHERE _TYPE_='RESIDUAL';
1802 NOTE: DATA statement used (Total process time):
1803       real time           0.00 seconds
1804       user cpu time       0.00 seconds
1805       system cpu time     0.00 seconds
1806       memory              599799.09k
1807       OS Memory           648792.00k
1808       Timestamp           07/01/2024 06:40:37 AM
1809       Step Count                        1  Switch Count  0
1810       Page Faults                       0
1811       Page Reclaims                     63
1812       Page Swaps                        0
1813       Voluntary Context Switches        1
1814       Involuntary Context Switches      0
1815       Block Input Operations            0
1816       Block Output Operations           0
1817
1818
1819
1820 NOTE: The file _EMSCR is:
1821       Filename=/home/u63452984/case-study-s2192852/Workspac
     es/EMWS3/HPDMForest/EMFLOWSCORE.sas,
1822       Owner Name=u63452984,Group Name=oda,
1823       Access Permission=-rw-r--r--,
1824       Last Modified=07 January 2024 06:40:37,
1825       File Size (bytes)=1898
1826
1827 NOTE: 23 records were written to the file _EMSCR.
1828       The minimum record length was 3.
1829       The maximum record length was 63.
1830 NOTE: DATA statement used (Total process time):
1831       real time           0.00 seconds
1832       user cpu time       0.00 seconds
```

```
1833       system cpu time     0.00 seconds
1834       memory              599799.09k
1835       OS Memory           648792.00k
1836       Timestamp           07/01/2024 06:40:37 AM
1837       Step Count                        1  Switch Count  0
1838       Page Faults                       0
1839       Page Reclaims                     30
1840       Page Swaps                        0
1841       Voluntary Context Switches        4
1842       Involuntary Context Switches      0
1843       Block Input Operations            0
1844       Block Output Operations           8
1845
1846
1847  16839  filename _emscr;
1848  NOTE: Fileref _EMSCR has been deassigned.
1849
1850  16840  filename emflow "/home/u63452984/case-study-s2192852
      /Workspaces/EMWS3/HPDMForest/EMFLOWSCORE.sas";
1851  16841  *-------------------------------------------------
      ---------*;
1852  16842  * HPDMForest: Scoring DATA data;
1853  16843  *-------------------------------------------------
      ---------*;
1854  16844  %let em_score_output = EMWS3.HPDMForest_TRAIN;
1855  16845  data EMWS3.HPDMForest_TRAIN;
1856  16846  set EMWS3.Part2_TRAIN
1857  16847  ;
1858  16848  %inc emflow;
1859  NOTE: %INCLUDE (level 1) file EMFLOW is file /home/u6345298
      4/case-study-s2192852/Workspaces/EMWS3/HPDMForest/EMFLOWSCO
      RE.sas.
1860  16849 +%macro em_hpfst_score;
1861  16850 +
1862  16851 +  %if %sysfunc(exist(work._score_temp)) %then %do;
1863  16852 +     proc delete data=work._score_temp;
```

```
1864 16853 +     run;
1865 16854 +  %end;
1866 16855 +
1867 16856 +  %if %symexist(hpfst_score_input)=0 %then %let hpfs
     t_score_input=&em_score_output;
1868 16857 +  %if %symexist(hpfst_score_output)=0 %then %let hpf
     st_score_output=&em_score_output;
1869 16858 +
1870 16859 +%let hpvvn= %sysfunc(getoption(VALIDVARNAME));
1871 16860 +options validvarname=V7;
1872 16861 +  proc hp4score data=&hpfst_score_input(keep=
1873 16862 +Age
1874 16863 +IMP_TotalSpent
1875 16864 +M_Variable
1876 16865 +MembershipLevel
1877 16866 +PaymentMethod
1878 16867 +TotalPurchases
1879 16868 +  );
1880 16869 +  %if %symexist(EM_USER_OUTMDLFILE)=0 %then %do;
1881 16870 +    score file="/home/u63452984/case-study-s2192852/
     Workspaces/EMWS3/HPDMForest/OUTMDLFILE.bin" out=work._outte
     mp;
1882 16871 +  %end;
1883 16872 +  %else %do;
1884 16873 +    score file="&EM_USER_OUTMDLFILE" out=work._outte
     mp;
1885 16874 +  %end;
1886 16875 +    PERFORMANCE  DETAILS nthreads=1;
1887 16876 +  run;
1888 16877 +
1889 16878 +options validvarname=&hpvvn;
1890 16879 +  data work._score_temp;
1891 16880 +     merge &hpfst_score_input work._outtemp;
1892 16881 +  run;
1893 16882 +
1894 16883 +  proc delete data=work._outtemp;
```

```
1895  16884 +  run;
1896  16885 +
1897  16886 +  data &hpfst_score_output;
1898  16887 +    set work._score_temp;
1899  16888 +%mend;
1900  16889 +
1901  16890 +%symdel hpfst_score_input hpfst_score_output EM_USER
      _OUTMDLFILE/nowarn;
1902  16891 +%em_hpfst_score;
1903
1904  NOTE: There were 17497 observations read from the data set
      EMWS3.PART2_TRAIN.
1905  NOTE: The data set EMWS3.HPDMFOREST_TRAIN has 17497 observa
      tions and 10 variables.
1906  NOTE: DATA statement used (Total process time):
1907        real time           0.01 seconds
1908        user cpu time       0.01 seconds
1909        system cpu time     0.00 seconds
1910        memory              599799.09k
1911        OS Memory           648792.00k
1912        Timestamp           07/01/2024 06:40:37 AM
1913        Step Count                        1  Switch Count  0
1914        Page Faults                       0
1915        Page Reclaims                     663
1916        Page Swaps                        0
1917        Voluntary Context Switches        44
1918        Involuntary Context Switches      0
1919        Block Input Operations            0
1920        Block Output Operations           3080
1921
1922
1923
1924  NOTE: Deleting WORK._SCORE_TEMP (memtype=DATA).
1925  NOTE: PROCEDURE DELETE used (Total process time):
1926        real time           0.00 seconds
1927        user cpu time       0.00 seconds
```

```
1928        system cpu time     0.00 seconds
1929        memory              599799.09k
1930        OS Memory           648792.00k
1931        Timestamp           07/01/2024 06:40:37 AM
1932        Step Count                        1  Switch Count  0
1933        Page Faults                       0
1934        Page Reclaims                     15
1935        Page Swaps                        0
1936        Voluntary Context Switches        0
1937        Involuntary Context Switches      0
1938        Block Input Operations            0
1939        Block Output Operations           0
1940
1941
1942
1943 NOTE: The HP4SCORE procedure is executing in single-machine
      mode.
1944 NOTE: There were 17497 observations read from the data set
     EMWS3.HPDMFOREST_TRAIN.
1945 NOTE: The data set WORK._OUTTEMP has 17497 observations and
      4 variables.
1946 NOTE: The PROCEDURE HP4SCORE printed page 7.
1947 NOTE: PROCEDURE HP4SCORE used (Total process time):
1948        real time           2.16 seconds
1949        user cpu time       2.10 seconds
1950        system cpu time     0.07 seconds
1951        memory              599799.09k
1952        OS Memory           648792.00k
1953        Timestamp           07/01/2024 06:40:39 AM
1954        Step Count                        1  Switch Count  0
1955        Page Faults                       0
1956        Page Reclaims                     64165
1957        Page Swaps                        0
1958        Voluntary Context Switches        49
1959        Involuntary Context Switches      3
1960        Block Input Operations            3104
```

```
1961        Block Output Operations           1032
1962
1963
1964
1965  NOTE: There were 17497 observations read from the data set
      EMWS3.HPDMFOREST_TRAIN.
1966  NOTE: There were 17497 observations read from the data set
      WORK._OUTTEMP.
1967  NOTE: The data set WORK._SCORE_TEMP has 17497 observations
      and 14 variables.
1968  NOTE: DATA statement used (Total process time):
1969        real time           0.00 seconds
1970        user cpu time       0.01 seconds
1971        system cpu time     0.00 seconds
1972        memory              599799.09k
1973        OS Memory           648792.00k
1974        Timestamp           07/01/2024 06:40:39 AM
1975        Step Count                        1  Switch Count  0
1976        Page Faults                       0
1977        Page Reclaims                     669
1978        Page Swaps                        0
1979        Voluntary Context Switches        4
1980        Involuntary Context Switches      0
1981        Block Input Operations            0
1982        Block Output Operations           3592
1983
1984
1985
1986  NOTE: Deleting WORK._OUTTEMP (memtype=DATA).
1987  NOTE: PROCEDURE DELETE used (Total process time):
1988        real time           0.00 seconds
1989        user cpu time       0.00 seconds
1990        system cpu time     0.00 seconds
1991        memory              599799.09k
1992        OS Memory           648792.00k
1993        Timestamp           07/01/2024 06:40:39 AM
```

```
1994        Step Count                         1  Switch Count  0
1995        Page Faults                        0
1996        Page Reclaims                      15
1997        Page Swaps                         0
1998        Voluntary Context Switches         0
1999        Involuntary Context Switches       0
2000        Block Input Operations             0
2001        Block Output Operations            0
2002
2003
2004  16892 +*------------------------------------------------
      ---------*;
2005  16893 +*Computing Classification Vars: IMP_Churn;
2006  16894 +*------------------------------------------------
      ---------*;
2007  16895 +length _format200 $200;
2008  16896 +drop _format200;
2009  16897 +length F_IMP_Churn $12;
2010  16898 +label  F_IMP_Churn = 'From: IMP_Churn';
2011  16899 +_format200= PUT( IMP_Churn, BEST12. );
2012  16900 +F_IMP_Churn=dmnorm(_format200,32); ;
2013  16901 +_format200= ' ' ;
2014  16902 +length _p_ 8;
2015  16903 +_p_= 0 ;
2016  16904 +drop _p_ ;
2017  16905 +if P_IMP_Churn1 - _p_ > 1E-8 then do ;
2018  16906 +   _p_= P_IMP_Churn1 ;
2019  16907 +   _format200='1';
2020  16908 +end;
2021  16909 +if P_IMP_Churn0 - _p_ > 1E-8 then do ;
2022  16910 +   _p_= P_IMP_Churn0 ;
2023  16911 +   _format200='0';
2024  16912 +end;
2025  16913 +I_IMP_Churn=dmnorm(_format200,32); ;
2026  16914 +length U_IMP_Churn 8;
2027  16915 +label U_IMP_Churn = 'Unnormalized Into: IMP_Churn';
```

```
2028  16916 +format U_IMP_Churn BEST12.;
2029  16917 +if I_IMP_Churn='1' then
2030  16918 +U_IMP_Churn=1;
2031  16919 +if I_IMP_Churn='0' then
2032  16920 +U_IMP_Churn=0;
2033  16921 +*-------------------------------------------------
      ---------*;
2034  16922 +*Computing Residual Vars: IMP_Churn;
2035  16923 +*-------------------------------------------------
      ---------*;
2036  16924 +Length R_IMP_Churn1 8;
2037  16925 +Label R_IMP_Churn1='Residual: IMP_Churn=1';
2038  16926 +Length R_IMP_Churn0 8;
2039  16927 +Label R_IMP_Churn0='Residual: IMP_Churn=0';
2040  16928 +if
2041  16929 + F_IMP_Churn ne '1'
2042  16930 +and F_IMP_Churn ne '0'
2043  16931 + then do;
2044  16932 +R_IMP_Churn1=.;
2045  16933 +R_IMP_Churn0=.;
2046  16934 +end;
2047  16935 +else do;
2048  16936 +R_IMP_Churn1= - P_IMP_Churn1;
2049  16937 +R_IMP_Churn0= - P_IMP_Churn0;
2050  16938 +select(F_IMP_Churn);
2051  16939 +when('1')R_IMP_Churn1= R_IMP_Churn1+1;
2052  16940 +when('0')R_IMP_Churn0= R_IMP_Churn0+1;
2053  16941 +otherwise;
2054  16942 +end;
2055  16943 +end;
2056  NOTE: %INCLUDE (level 1) ending.
2057  16944  run;
2058
2059  NOTE: There were 17497 observations read from the data set
      WORK._SCORE_TEMP.
2060  NOTE: The data set EMWS3.HPDMFOREST_TRAIN has 17497 observa
```

```
     tions and 18 variables.
2061 NOTE: DATA statement used (Total process time):
2062       real time           0.02 seconds
2063       user cpu time       0.01 seconds
2064       system cpu time     0.00 seconds
2065       memory              599799.09k
2066       OS Memory           648792.00k
2067       Timestamp           07/01/2024 06:40:39 AM
2068       Step Count                        1  Switch Count  0
2069       Page Faults                       0
2070       Page Reclaims                     544
2071       Page Swaps                        0
2072       Voluntary Context Switches        76
2073       Involuntary Context Switches      0
2074       Block Input Operations            0
2075       Block Output Operations           5128
2076
2077
2078 16945  quit;
2079
2080 16946  filename emflow "/home/u63452984/case-study-s2192852
     /Workspaces/EMWS3/HPDMForest/EMFLOWSCORE.sas";
2081 16947  *-------------------------------------------------
     ---------*;
2082 16948  * HPDMForest: Scoring VALIDATE data;
2083 16949  *-------------------------------------------------
     ---------*;
2084 16950  %let em_score_output = EMWS3.HPDMForest_VALIDATE;
2085 16951  data EMWS3.HPDMForest_VALIDATE;
2086 16952  set EMWS3.Part2_VALIDATE
2087 16953  ;
2088 16954  %inc emflow;
2089 NOTE: %INCLUDE (level 1) file EMFLOW is file /home/u6345298
     4/case-study-s2192852/Workspaces/EMWS3/HPDMForest/EMFLOWSCO
     RE.sas.
2090 16955 +%macro em_hpfst_score;
```

```
2091  16956 +
2092  16957 +  %if %sysfunc(exist(work._score_temp)) %then %do;
2093  16958 +     proc delete data=work._score_temp;
2094  16959 +     run;
2095  16960 +  %end;
2096  16961 +
2097  16962 +  %if %symexist(hpfst_score_input)=0 %then %let hpfs
      t_score_input=&em_score_output;
2098  16963 +  %if %symexist(hpfst_score_output)=0 %then %let hpf
      st_score_output=&em_score_output;
2099  16964 +
2100  16965 +%let hpvvn= %sysfunc(getoption(VALIDVARNAME));
2101  16966 +options validvarname=V7;
2102  16967 +  proc hp4score data=&hpfst_score_input(keep=
2103  16968 +Age
2104  16969 +IMP_TotalSpent
2105  16970 +M_Variable
2106  16971 +MembershipLevel
2107  16972 +PaymentMethod
2108  16973 +TotalPurchases
2109  16974 +  );
2110  16975 +  %if %symexist(EM_USER_OUTMDLFILE)=0 %then %do;
2111  16976 +    score file="/home/u63452984/case-study-s2192852/
      Workspaces/EMWS3/HPDMForest/OUTMDLFILE.bin" out=work._outte
      mp;
2112  16977 +  %end;
2113  16978 +  %else %do;
2114  16979 +    score file="&EM_USER_OUTMDLFILE" out=work._outte
      mp;
2115  16980 +  %end;
2116  16981 +    PERFORMANCE  DETAILS nthreads=1;
2117  16982 +  run;
2118  16983 +
2119  16984 +options validvarname=&hpvvn;
2120  16985 +  data work._score_temp;
2121  16986 +     merge &hpfst_score_input work._outtemp;
```

```
2122  16987 +  run;
2123  16988 +
2124  16989 +  proc delete data=work._outtemp;
2125  16990 +  run;
2126  16991 +
2127  16992 +  data &hpfst_score_output;
2128  16993 +    set work._score_temp;
2129  16994 +%mend;
2130  16995 +
2131  16996 +%symdel hpfst_score_input hpfst_score_output EM_USER
      _OUTMDLFILE/nowarn;
2132  16997 +%em_hpfst_score;
2133
2134  NOTE: There were 7502 observations read from the data set E
      MWS3.PART2_VALIDATE.
2135  NOTE: The data set EMWS3.HPDMFOREST_VALIDATE has 7502 obser
      vations and 10 variables.
2136  NOTE: DATA statement used (Total process time):
2137        real time           0.01 seconds
2138        user cpu time       0.00 seconds
2139        system cpu time     0.00 seconds
2140        memory              599799.09k
2141        OS Memory           648792.00k
2142        Timestamp           07/01/2024 06:40:39 AM
2143        Step Count                        1  Switch Count  0
2144        Page Faults                       0
2145        Page Reclaims                     354
2146        Page Swaps                        0
2147        Voluntary Context Switches        21
2148        Involuntary Context Switches      0
2149        Block Input Operations            0
2150        Block Output Operations           1544
2151
2152
2153
2154  NOTE: Deleting WORK._SCORE_TEMP (memtype=DATA).
```

```
2155 NOTE: PROCEDURE DELETE used (Total process time):
2156       real time           0.00 seconds
2157       user cpu time       0.00 seconds
2158       system cpu time     0.00 seconds
2159       memory              599799.09k
2160       OS Memory           648792.00k
2161       Timestamp           07/01/2024 06:40:39 AM
2162       Step Count                        1  Switch Count  0
2163       Page Faults                       0
2164       Page Reclaims                     15
2165       Page Swaps                        0
2166       Voluntary Context Switches        0
2167       Involuntary Context Switches      0
2168       Block Input Operations            0
2169       Block Output Operations           0
2170
2171
2172
2173 NOTE: The HP4SCORE procedure is executing in single-machine
      mode.
2174 NOTE: There were 7502 observations read from the data set E
     MWS3.HPDMFOREST_VALIDATE.
2175 NOTE: The data set WORK._OUTTEMP has 7502 observations and
     4 variables.
2176 NOTE: The PROCEDURE HP4SCORE printed page 8.
2177 NOTE: PROCEDURE HP4SCORE used (Total process time):
2178       real time           1.52 seconds
2179       user cpu time       1.45 seconds
2180       system cpu time     0.08 seconds
2181       memory              599799.09k
2182       OS Memory           648792.00k
2183       Timestamp           07/01/2024 06:40:41 AM
2184       Step Count                        1  Switch Count  0
2185       Page Faults                       0
2186       Page Reclaims                     63931
2187       Page Swaps                        0
```

```
2188       Voluntary Context Switches        32
2189       Involuntary Context Switches      2
2190       Block Input Operations            1568
2191       Block Output Operations           520
2192
2193
2194
2195 NOTE: There were 7502 observations read from the data set E
     MWS3.HPDMFOREST_VALIDATE.
2196 NOTE: There were 7502 observations read from the data set W
     ORK._OUTTEMP.
2197 NOTE: The data set WORK._SCORE_TEMP has 7502 observations a
     nd 14 variables.
2198 NOTE: DATA statement used (Total process time):
2199       real time           0.00 seconds
2200       user cpu time       0.00 seconds
2201       system cpu time     0.00 seconds
2202       memory              599799.09k
2203       OS Memory           648792.00k
2204       Timestamp           07/01/2024 06:40:41 AM
2205       Step Count                        1  Switch Count  0
2206       Page Faults                       0
2207       Page Reclaims                     296
2208       Page Swaps                        0
2209       Voluntary Context Switches        4
2210       Involuntary Context Switches      0
2211       Block Input Operations            0
2212       Block Output Operations           1544
2213
2214
2215
2216 NOTE: Deleting WORK._OUTTEMP (memtype=DATA).
2217 NOTE: PROCEDURE DELETE used (Total process time):
2218       real time           0.00 seconds
2219       user cpu time       0.00 seconds
2220       system cpu time     0.00 seconds
```

```
2221        memory              599799.09k
2222        OS Memory           648792.00k
2223        Timestamp           07/01/2024 06:40:41 AM
2224        Step Count                        1  Switch Count  0
2225        Page Faults                       0
2226        Page Reclaims                     15
2227        Page Swaps                        0
2228        Voluntary Context Switches        0
2229        Involuntary Context Switches      0
2230        Block Input Operations            0
2231        Block Output Operations           0
2232
2233
2234  16998 +*-------------------------------------------------
      ---------*;
2235  16999 +*Computing Classification Vars: IMP_Churn;
2236  17000 +*-------------------------------------------------
      ---------*;
2237  17001 +length _format200 $200;
2238  17002 +drop _format200;
2239  17003 +length F_IMP_Churn $12;
2240  17004 +label  F_IMP_Churn = 'From: IMP_Churn';
2241  17005 +_format200= PUT( IMP_Churn, BEST12. );
2242  17006 +F_IMP_Churn=dmnorm(_format200,32); ;
2243  17007 +_format200= ' ' ;
2244  17008 +length _p_ 8;
2245  17009 +_p_= 0 ;
2246  17010 +drop _p_ ;
2247  17011 +if P_IMP_Churn1 - _p_ > 1E-8 then do ;
2248  17012 +   _p_= P_IMP_Churn1 ;
2249  17013 +   _format200='1';
2250  17014 +end;
2251  17015 +if P_IMP_Churn0 - _p_ > 1E-8 then do ;
2252  17016 +   _p_= P_IMP_Churn0 ;
2253  17017 +   _format200='0';
2254  17018 +end;
```

```
2255  17019 +I_IMP_Churn=dmnorm(_format200,32); ;
2256  17020 +length U_IMP_Churn 8;
2257  17021 +label U_IMP_Churn = 'Unnormalized Into: IMP_Churn';
2258  17022 +format U_IMP_Churn BEST12.;
2259  17023 +if I_IMP_Churn='1' then
2260  17024 +U_IMP_Churn=1;
2261  17025 +if I_IMP_Churn='0' then
2262  17026 +U_IMP_Churn=0;
2263  17027 +*-------------------------------------------------
      ---------*;
2264  17028 +*Computing Residual Vars: IMP_Churn;
2265  17029 +*-------------------------------------------------
      ---------*;
2266  17030 +Length R_IMP_Churn1 8;
2267  17031 +Label R_IMP_Churn1='Residual: IMP_Churn=1';
2268  17032 +Length R_IMP_Churn0 8;
2269  17033 +Label R_IMP_Churn0='Residual: IMP_Churn=0';
2270  17034 +if
2271  17035 + F_IMP_Churn ne '1'
2272  17036 +and F_IMP_Churn ne '0'
2273  17037 + then do;
2274  17038 +R_IMP_Churn1=.;
2275  17039 +R_IMP_Churn0=.;
2276  17040 +end;
2277  17041 +else do;
2278  17042 +R_IMP_Churn1= - P_IMP_Churn1;
2279  17043 +R_IMP_Churn0= - P_IMP_Churn0;
2280  17044 +select(F_IMP_Churn);
2281  17045 +when('1')R_IMP_Churn1= R_IMP_Churn1+1;
2282  17046 +when('0')R_IMP_Churn0= R_IMP_Churn0+1;
2283  17047 +otherwise;
2284  17048 +end;
2285  17049 +end;
2286  NOTE: %INCLUDE (level 1) ending.
2287  17050  run;
2288
```

```
2289 NOTE: There were 7502 observations read from the data set W
     ORK._SCORE_TEMP.
2290 NOTE: The data set EMWS3.HPDMFOREST_VALIDATE has 7502 obser
     vations and 18 variables.
2291 NOTE: DATA statement used (Total process time):
2292       real time           0.01 seconds
2293       user cpu time       0.01 seconds
2294       system cpu time     0.00 seconds
2295       memory              599799.09k
2296       OS Memory           648792.00k
2297       Timestamp           07/01/2024 06:40:41 AM
2298       Step Count                        1  Switch Count  0
2299       Page Faults                       0
2300       Page Reclaims                     355
2301       Page Swaps                        0
2302       Voluntary Context Switches        34
2303       Involuntary Context Switches      0
2304       Block Input Operations            0
2305       Block Output Operations           2312
2306
2307
2308 17051  quit;
2309
2310 17112  proc append base=EMWS3.HPDMForest_EMOUTFIT data=WORK
     .OUTFITDATA force;
2311 17113  run;
2312
2313 NOTE: Appending WORK.OUTFITDATA to EMWS3.HPDMFOREST_EMOUTFI
     T.
2314 NOTE: BASE data set does not exist. DATA file is being copi
     ed to BASE file.
2315 NOTE: There were 1 observations read from the data set WORK
     .OUTFITDATA.
2316 NOTE: The data set EMWS3.HPDMFOREST_EMOUTFIT has 1 observat
     ions and 19 variables.
2317 NOTE: PROCEDURE APPEND used (Total process time):
```

```
2318       real time           0.00 seconds
2319       user cpu time       0.00 seconds
2320       system cpu time     0.00 seconds
2321       memory              599799.09k
2322       OS Memory           648792.00k
2323       Timestamp           07/01/2024 06:40:41 AM
2324       Step Count                        1  Switch Count  0
2325       Page Faults                       0
2326       Page Reclaims                     153
2327       Page Swaps                        0
2328       Voluntary Context Switches        16
2329       Involuntary Context Switches      0
2330       Block Input Operations            0
2331       Block Output Operations           272
2332
2333
2334 17114  *-------------------------------------------------
     ---------*;
2335 17115  * HPDMForest: Computing metadata for TRAIN data;
2336 17116  *-------------------------------------------------
     ---------*;
2337
2338 17476  data EMWS3.HPDMForest_EMINFO;
2339 17477  length TARGET KEY $32 DATA $43;
2340 17478  input TARGET KEY DATA $;
2341 17479  cards;
2342
2343 NOTE: The data set EMWS3.HPDMFOREST_EMINFO has 3 observatio
     ns and 3 variables.
2344 NOTE: DATA statement used (Total process time):
2345       real time           0.00 seconds
2346       user cpu time       0.00 seconds
2347       system cpu time     0.00 seconds
2348       memory              599799.09k
2349       OS Memory           648792.00k
2350       Timestamp           07/01/2024 06:40:41 AM
```

```
2351        Step Count                         1  Switch Count  0
2352        Page Faults                        0
2353        Page Reclaims                      99
2354        Page Swaps                         0
2355        Voluntary Context Switches         12
2356        Involuntary Context Switches       0
2357        Block Input Operations             0
2358        Block Output Operations            264
2359
2360
2361  17483  run;
2362  17484  proc sort data = EMWS3.HPDMForest_EMINFO NOTHREADS;
2363  17485  by TARGET KEY;
2364  17486  run;
2365
2366  NOTE: There were 3 observations read from the data set EMWS
      3.HPDMFOREST_EMINFO.
2367  NOTE: The data set EMWS3.HPDMFOREST_EMINFO has 3 observatio
      ns and 3 variables.
2368  NOTE: PROCEDURE SORT used (Total process time):
2369        real time           0.01 seconds
2370        user cpu time       0.00 seconds
2371        system cpu time     0.00 seconds
2372        memory              599799.09k
2373        OS Memory           648792.00k
2374        Timestamp           07/01/2024 06:40:41 AM
2375        Step Count                         1  Switch Count  0
2376        Page Faults                        0
2377        Page Reclaims                      117
2378        Page Swaps                         0
2379        Voluntary Context Switches         37
2380        Involuntary Context Switches       0
2381        Block Input Operations             288
2382        Block Output Operations            264
2383
2384
```

```
2385 17487  proc sort data = EMWS3.Ids_EMINFO OUT=WORK.SORTEDEMI
     NFO NOTHREADS;
2386 17488  by TARGET KEY;
2387 17489  run;
2388
2389 NOTE: There were 4 observations read from the data set EMWS
     3.IDS_EMINFO.
2390 NOTE: The data set WORK.SORTEDEMINFO has 4 observations and
      3 variables.
2391 NOTE: PROCEDURE SORT used (Total process time):
2392       real time           0.00 seconds
2393       user cpu time       0.00 seconds
2394       system cpu time     0.00 seconds
2395       memory              599799.09k
2396       OS Memory           648792.00k
2397       Timestamp           07/01/2024 06:40:41 AM
2398       Step Count                        1  Switch Count  0
2399       Page Faults                       0
2400       Page Reclaims                     152
2401       Page Swaps                        0
2402       Voluntary Context Switches        4
2403       Involuntary Context Switches      0
2404       Block Input Operations            0
2405       Block Output Operations           272
2406
2407
2408 17490  proc sort data = EMWS3.HPDMForest_EMINFO OUT=WORK.TE
     MP_INFO NOTHREADS;
2409 17491  by TARGET KEY;
2410 17492  run;
2411
2412 NOTE: Input data set is already sorted; it has been copied
     to the output data set.
2413 NOTE: There were 3 observations read from the data set EMWS
     3.HPDMFOREST_EMINFO.
2414 NOTE: The data set WORK.TEMP_INFO has 3 observations and 3
```

```
     variables.
2415 NOTE: PROCEDURE SORT used (Total process time):
2416       real time           0.00 seconds
2417       user cpu time       0.00 seconds
2418       system cpu time     0.00 seconds
2419       memory              599799.09k
2420       OS Memory           648792.00k
2421       Timestamp           07/01/2024 06:40:41 AM
2422       Step Count                        1  Switch Count  0
2423       Page Faults                       0
2424       Page Reclaims                     116
2425       Page Swaps                        0
2426       Voluntary Context Switches        11
2427       Involuntary Context Switches      0
2428       Block Input Operations            288
2429       Block Output Operations           264
2430
2431
2432 17493  data EMWS3.HPDMForest_EMINFO;
2433 17494  merge WORK.SORTEDEMINFO WORK.TEMP_INFO;
2434 17495  by TARGET KEY;
2435 17496  run;
2436
2437 NOTE: There were 4 observations read from the data set WORK
     .SORTEDEMINFO.
2438 NOTE: There were 3 observations read from the data set WORK
     .TEMP_INFO.
2439 NOTE: The data set EMWS3.HPDMFOREST_EMINFO has 7 observatio
     ns and 3 variables.
2440 NOTE: DATA statement used (Total process time):
2441       real time           0.01 seconds
2442       user cpu time       0.00 seconds
2443       system cpu time     0.01 seconds
2444       memory              599799.09k
2445       OS Memory           648792.00k
2446       Timestamp           07/01/2024 06:40:41 AM
```

```
2447        Step Count                         1  Switch Count  0
2448        Page Faults                        0
2449        Page Reclaims                      173
2450        Page Swaps                         0
2451        Voluntary Context Switches         28
2452        Involuntary Context Switches       0
2453        Block Input Operations             0
2454        Block Output Operations            264
2455
2456
2457 17497  proc datasets lib=work nolist;
2458 17498  delete TEMP_INFO SORTEDEMINFO;
2459 17499  run;
2460
2461 NOTE: Deleting WORK.TEMP_INFO (memtype=DATA).
2462 NOTE: Deleting WORK.SORTEDEMINFO (memtype=DATA).
2463 17500  quit;
2464
2465 NOTE: PROCEDURE DATASETS used (Total process time):
2466       real time           0.00 seconds
2467       user cpu time       0.00 seconds
2468       system cpu time     0.00 seconds
2469       memory              599799.09k
2470       OS Memory           648792.00k
2471       Timestamp           07/01/2024 06:40:41 AM
2472       Step Count                         1  Switch Count  0
2473       Page Faults                        0
2474       Page Reclaims                      55
2475       Page Swaps                         0
2476       Voluntary Context Switches         0
2477       Involuntary Context Switches       0
2478       Block Input Operations             0
2479       Block Output Operations            8
2480
2481
2482 *------------------------------------------------------------
```

```
     --*
2483 * Report Log
2484 Date:                07 January 2024
2485 Time:                06:40:42
2486 *-------------------------------------------------------
     --*
2487 17524  data EMWS3.HPDMForest_EMOUTFIT;
2488 17525  set EMWS3.HPDMForest_EMOUTFIT;
2489 17526  length TargetLabel $200;
2490 17527  label targetLabel = "%sysfunc(sasmsg(sashelp.dmine,
     meta_targetlabel_vlabel, NOQUOTE))";
2491 17528  if upcase(TARGET) eq "IMP_CHURN" then TargetLabel =
     'Imputed Churn';
2492 17529  run;
2493
2494 NOTE: There were 1 observations read from the data set EMWS
     3.HPDMFOREST_EMOUTFIT.
2495 NOTE: The data set EMWS3.HPDMFOREST_EMOUTFIT has 1 observat
     ions and 20 variables.
2496 NOTE: DATA statement used (Total process time):
2497       real time           0.01 seconds
2498       user cpu time       0.00 seconds
2499       system cpu time     0.00 seconds
2500       memory              599799.09k
2501       OS Memory           648792.00k
2502       Timestamp           07/01/2024 06:40:41 AM
2503       Step Count                        1  Switch Count  0
2504       Page Faults                       0
2505       Page Reclaims                     244
2506       Page Swaps                        0
2507       Voluntary Context Switches        37
2508       Involuntary Context Switches      0
2509       Block Input Operations            288
2510       Block Output Operations           264
2511
2512
```

```
2513 17530  proc sort data=EMWS3.HPDMForest_EMREPORTFIT nothread
     s;
2514 17531  by TARGET;
2515 17532  run;
2516
2517 NOTE: There were 9 observations read from the data set EMWS
     3.HPDMFOREST_EMREPORTFIT.
2518 NOTE: The data set EMWS3.HPDMFOREST_EMREPORTFIT has 9 obser
     vations and 7 variables.
2519 NOTE: PROCEDURE SORT used (Total process time):
2520       real time           0.01 seconds
2521       user cpu time       0.00 seconds
2522       system cpu time     0.00 seconds
2523       memory              599799.09k
2524       OS Memory           648792.00k
2525       Timestamp           07/01/2024 06:40:41 AM
2526       Step Count                        1  Switch Count  0
2527       Page Faults                       0
2528       Page Reclaims                     116
2529       Page Swaps                        0
2530       Voluntary Context Switches        29
2531       Involuntary Context Switches      0
2532       Block Input Operations            0
2533       Block Output Operations           272
2534
2535
2536 17533  %let _EMwarndup = 0;
2537 17534  %let _EMtargetdup =;
2538 17535  %let _EMASEtargetdup =;
2539 17536  data _null_;
2540 17537  set EMWS3.HPDMForest_EMOUTFIT;
2541 17538  if ._ASE_<0.000001 then do;
2542 17539  call symput('_EMwarndup', '1');
2543 17540  call symput('_EMtargetdup', target);
2544 17541  call symput('_EMASEtargetdup', put(_ASE_, best.));
2545 17542  end;
```

```
2546 17543  run;
2547
2548 NOTE: There were 1 observations read from the data set EMWS
     3.HPDMFOREST_EMOUTFIT.
2549 NOTE: DATA statement used (Total process time):
2550       real time           0.00 seconds
2551       user cpu time       0.00 seconds
2552       system cpu time     0.00 seconds
2553       memory              599799.09k
2554       OS Memory           648792.00k
2555       Timestamp           07/01/2024 06:40:41 AM
2556       Step Count                        1  Switch Count  0
2557       Page Faults                       0
2558       Page Reclaims                     63
2559       Page Swaps                        0
2560       Voluntary Context Switches        3
2561       Involuntary Context Switches      1
2562       Block Input Operations            0
2563       Block Output Operations           0
2564
2565
2566 17544  %let EMEXCEPTIONSTRING=;
2567 17545  *-------------------------------------------------
     ---------*;
2568 17546  * REPORT: HPDMForest;
2569 17547  *-------------------------------------------------
     ---------*;
2570 17548  %let EM_ACTION = REPORT;
2571 17549  %let syscc = 0;
2572 17550  %macro main;
2573 17551
2574 17552     %if %upcase(&EM_ACTION) = CREATE %then %do;
2575 17553         filename temp catalog 'sashelp.hpdm.hpdmfores
     t_create.source';
2576 17554         %include temp;
2577 17555         filename temp;
```

```
2578 17556         %hpdm_Forest_create;
2579 17557     %end;
2580 17558     %else
2581 17559     %if %upcase(&EM_ACTION) = TRAIN %then %do;
2582 17560         filename temp catalog 'sashelp.hpdm.hpdmfores
     t_train.source';
2583 17561         %include temp;
2584 17562         filename temp;
2585 17563         %hpdm_Forest_train;
2586 17564     %end;
2587 17565     %else
2588 17566     %if %upcase(&EM_ACTION) = SCORE %then %do;
2589 17567         %em_checkmacro(name=EM_PROPERTY_VARSELECT, va
     lue=Y, global=Y);
2590 17568         %em_checkmacro(name=EM_PROPERTY_VIMETHOD, val
     ue=LOSSREDUCTION);
2591 17569          %if "&EM_PROPERTY_VARSELECT" eq "Y" and "&EM
     _PROPERTY_VIMETHOD" = "RBA" %then %do;
2592 17570             %em_getname(key=OUTMDLFILE, type=FILE, e
     xtension=bin);
2593 17571             %if %sysfunc(fileexist(&EM_USER_OUTMDLFI
     LE))=0 %then %do;
2594 17572                 /* when the Variable Importance meth
     od has changed to RBA after running with Use as Modeling=No
     , need to re-train to create the outmdl file */
2595 17573                 filename temp catalog 'sashelp.hpdm.h
     pdmforest_train.source';
2596 17574                 %include temp;
2597 17575                 filename temp;
2598 17576                 %hpdm_Forest_train;
2599 17577             %end;
2600 17578          %end;
2601 17579          filename temp catalog 'sashelp.hpdm.hpdmfore
     st_score.source';
2602 17580          %include temp;
2603 17581          filename temp;
```

```
2604 17582          %hpdm_Forest_score;
2605 17583     %end;
2606 17584     %else
2607 17585     %if %upcase(&EM_ACTION) = REPORT %then %do;
2608 17586         filename temp catalog 'sashelp.hpdm.hpdmfores
     t_report.source';
2609 17587         %include temp;
2610 17588         filename temp;
2611 17589         %hpdm_Forest_report;
2612 17590     %end;
2613 17591     %else
2614 17592
2615 17593  %mend main;
2616 17594
2617 17595  %main;
2618 NOTE: %INCLUDE (level 1) file TEMP is file SASHELP.HPDM.HPD
     MFOREST_REPORT.SOURCE.
2619 17596 +%Macro hpdm_Forest_report;
2620 17598 +   /* Baseline Table */
2621 17599 +   %EM_GETNAME(KEY=BASELINE, TYPE=DATA);
2622 17600 +   data &EM_USER_BASELINE;
2623 17601 +     set &EM_USER_BASELINE;
2624 17602 +     label statistic  = "%sysfunc(sasmsg(sashelp.dmi
     ne, rpt_rptstatistic_vlabel ,  NOQUOTE))"
2625 17603 +           value      = "%sysfunc(sasmsg(sashelp.dmi
     ne, rpt_roletrain_value,  NOQUOTE))"
2626 17604 +           validation   = "%sysfunc(sasmsg(sashelp.d
     mine, rpt_validate_vlabel,  NOQUOTE))"
2627 17605 +     ;
2628 17606 +   run;
2629 17607 +   %EM_REPORT(key=BASELINE, viewtype=DATA, block=MOD
     EL, description=BASELINE, autodisplay=N);
2630 17609 +   /* Iteration Table */
2631 17610 +   %EM_GETNAME(KEY=ITERATION, TYPE=DATA);
2632 17611 +   data &EM_USER_ITERATION;
2633 17612 +     set &EM_USER_ITERATION;
```

```
2634 17613 +     label Ntrees = "%sysfunc(sasmsg(sashelp.dmine,
     rpt_hpnumtrees_vlabel,  NOQUOTE))"
2635 17614 +           NLeaves = "%sysfunc(sasmsg(sashelp.dmine,
      rpt_nleaves_vlabel,  NOQUOTE))"
2636 17615 +           MiscAll = "%sysfunc(sasmsg(sashelp.dmine,
      rpt_miscall_vlabel,  NOQUOTE))"
2637 17616 +           MiscOob = "%sysfunc(sasmsg(sashelp.dmine,
      rpt_miscoob_vlabel,  NOQUOTE))"
2638 17617 +           MiscValid = "%sysfunc(sasmsg(sashelp.dmin
     e, rpt_miscvalid_vlabel,  NOQUOTE))"
2639 17618 +           PredAll = "%sysfunc(sasmsg(sashelp.dmine,
      rpt_predall_vlabel,  NOQUOTE))"
2640 17619 +           PredOob = "%sysfunc(sasmsg(sashelp.dmine,
      rpt_predoob_vlabel,  NOQUOTE))"
2641 17620 +           PredValid = "%sysfunc(sasmsg(sashelp.dmin
     e, rpt_predvalid_vlabel,  NOQUOTE))"
2642 17621 +           LogLossAll = "%sysfunc(sasmsg(sashelp.dmi
     ne, rpt_loglossall_vlabel,  NOQUOTE))"
2643 17622 +           LogLossOob = "%sysfunc(sasmsg(sashelp.dmi
     ne, rpt_loglossoob_vlabel,  NOQUOTE))"
2644 17623 +           LogLossValid = "%sysfunc(sasmsg(sashelp.d
     mine, rpt_loglossvalid_vlabel,  NOQUOTE))"
2645 17624 +           ;
2646 17625 +   run;
2647 17626 +   %EM_REPORT(key=ITERATION, viewtype=DATA, block=MO
     DEL, description=HPFORESTITERHIST, autodisplay=Y);
2648 17628 +   /* Iteration Plots */
2649 17630 +   /* if run on the grid, the iteration information
     is not retained therefore we do not want to generate the pl
     ots */
2650 17631 +   %let iterdsid = %sysfunc(open(&EM_USER_ITERATION)
     );
2651 17632 +   %let iternum=0;
2652 17633 +   %if &iterdsid %then %do;
2653 17634 +     %let iternum = %sysfunc(ATTRN(&iterdsid, NOBS))
     ;
```

```
2654 17635 +   %end;
2655 17636 +   %if &iterdsid ne %then %let iterdsid = %sysfunc(c
     lose(&iterdsid));
2656 17638 +   %if &iternum > 1 %then %do;
2657 17639 +     %EM_GETNAME(KEY=ITERPLOT, TYPE=DATA);
2658 17641 +     %if "%EM_TARGET_LEVEL" ne "INTERVAL" %then %do;
2659 17643 +       /* determine if miscoob is in iteration table
      */
2660 17644 +       %local miscoob miscvalid;
2661 17645 +       data _null_;
2662 17646 +         set &EM_USER_ITERATION (obs=2) end=eof;
2663 17647 +         if eof then do;
2664 17648 +           call symput("miscoob"  , strip(put(miscoo
     b, best.)));
2665 17649 +           call symput("miscvalid"  , strip(put(misc
     valid, best.)));
2666 17650 +         end;
2667 17651 +       run;
2668 17653 +       data &EM_USER_ITERPLOT;
2669 17654 +         length DataSource $32;
2670 17655 +         set &EM_USER_ITERATION(in=_a rename=(MISCAL
     L=_MISC_ PREDALL=_ASE_) keep=MISCALL PREDALL NTREES)
2671 17656 +           /* if leafFraction=1 then OOB values are
      not generated */
2672 17657 +           %if ((&EM_PROPERTY_TRAINFRACTION ne 1.0)
      AND ("&miscoob" ne ".")) %then %do;
2673 17658 +             &EM_USER_ITERATION(in=_b rename=(MISCO
     OB =_MISC_ PREDOOB=_ASE_) keep=MISCOOB PREDOOB NTREES)
2674 17659 +           %end;
2675 17660 +           %if ("&miscvalid" ne ".") %then %do;
2676 17661 +             &EM_USER_ITERATION(in=_c rename=(MISCv
     alid =_MISC_ PREDValid=_ASE_) keep=MISCvalid PREDvalid NTRE
     ES)
2677 17662 +           %end;
2678 17663 +         ;
2679 17664 +         if _a then do;
```

```
2680 17665 +           DataSource = "%sysfunc(sasmsg(sashelp.dmi
     ne, rpt_roletrain_value,  NOQUOTE))";
2681 17666 +         end;
2682 17667 +         else if _b then do;
2683 17668 +           DataSource = "%sysfunc(sasmsg(sashelp.dmi
     ne, rpt_outofbag_vlabel,  NOQUOTE))";
2684 17669 +         end;
2685 17670 +         else if _c then do;
2686 17671 +            DataSource = "%sysfunc(sasmsg(sashelp.dm
     ine, rpt_rolevalidate_value,  NOQUOTE))";
2687 17672 +         end;
2688 17673 +         label _MISC_ = "%sysfunc(sasmsg(sashelp.dmi
     ne, rpt_misclassrate_vlabel,  NOQUOTE))"
2689 17674 +                datasource="%sysfunc(sasmsg(sashelp.d
     mine, meta_datasource_vlabel,  NOQUOTE))"
2690 17675 +                _ASE_  = "%sysfunc(sasmsg(sashelp.dmi
     ne, stat_ase_vlabel,  NOQUOTE))";
2691 17676 +         keep ntrees datasource _MISC_ _ASE_;
2692 17677 +       run;
2693 17679 +       %EM_REPORT(key=ITERPLOT, viewtype=LINEPLOT, b
     lock=MODEL, view=1, X=NTrees, Y=_MISC_, group=DataSource, a
     utodisplay=Y, Description=HPFORESTITERPLOT);
2694 17680 +       %EM_REPORT(VIEW=1, Y=_ASE_);
2695 17681 +      %end;
2696 17682 +      %else %do;
2697 17683 +       /* determine if predoob is in iteration table
      */
2698 17684 +       %local predoob predvalid;
2699 17685 +       data _null_;
2700 17686 +         set &EM_USER_ITERATION (obs=2) end=eof;
2701 17687 +         if eof then do;
2702 17688 +           call symput("predoob"  , strip(put(predoo
     b, best.)));
2703 17689 +           call symput("predvalid"  , strip(put(pred
     valid, best.)));
2704 17690 +         end;
```

```
2705 17691 +       run;
2706 17692 +       data &EM_USER_ITERPLOT;
2707 17693 +         length DataSource $32;
2708 17694 +         set &EM_USER_ITERATION(in=_a rename=(PREDAL
     L=_ASE_) keep=PREDALL NTREES)
2709 17695 +             /* if leafFraction=1 then OOB values are
      not generated */
2710 17696 +             %if ((&EM_PROPERTY_TRAINFRACTION ne 1.0)
      AND ("&predoob" ne ".")) %then %do;
2711 17697 +               &EM_USER_ITERATION(in=_b rename=(PREDO
     OB=_ASE_) keep= PREDOOB NTREES)
2712 17698 +             %end;
2713 17699 +             %if ("&predvalid" ne ".") %then %do;
2714 17700 +               &EM_USER_ITERATION(in=_c rename=(PREDv
     alid=_ASE_) keep= PREDvalid NTREES)
2715 17701 +             %end;
2716 17702 +         ;
2717 17703 +         if _a then do;
2718 17704 +           DataSource = "%sysfunc(sasmsg(sashelp.dmi
     ne, rpt_roletrain_value,  NOQUOTE))";
2719 17705 +         end;
2720 17706 +         else if _b then do;
2721 17707 +           DataSource = "%sysfunc(sasmsg(sashelp.dmi
     ne, rpt_outofbag_vlabel,  NOQUOTE))";
2722 17708 +         end;
2723 17709 +         else if _c then do;
2724 17710 +           DataSource = "%sysfunc(sasmsg(sashelp.dmi
     ne, rpt_rolevalidate_value,  NOQUOTE))";
2725 17711 +         end;
2726 17712 +         label _ASE_  = "%sysfunc(sasmsg(sashelp.dmi
     ne, stat_ase_vlabel,  NOQUOTE))"
2727 17713 +               datasource="%sysfunc(sasmsg(sashelp.d
     mine, meta_datasource_vlabel,  NOQUOTE))"
2728 17714 +         ;
2729 17715 +         keep ntrees datasource _ASE_;
2730 17716 +       run;
```

```
2731 17718 +       %EM_REPORT(key=ITERPLOT, viewtype=LINEPLOT, b
     lock=MODEL, view=1, X=NTrees, Y=_ASE_, group=DataSource, au
     todisplay=Y, Description=HPFORESTITERPLOT);
2732 17719 +       /* %EM_REPORT(VIEW=1, Y=_ASE_); */
2733 17720 +      %end;
2734 17722 +      /* calculate number of leaves in each tree vs
     cumulative counts and generate plotting table */
2735 17723 +      data work.tempLeavesBase(keep= NTrees NLeavesB
     ase) work.tempLeavesInc(keep=NTrees NLeavesPerTree);
2736 17724 +        set &EM_USER_ITERATION;
2737 17725 +        length NLeavesPerTree NLeavesBase 8;
2738 17727 +        retain previousN;
2739 17729 +        if _N_=1 then do;
2740 17730 +         previousN=NLeaves;
2741 17731 +         NLeavesPerTree=0;
2742 17732 +         NLeavesBase=NLeaves;
2743 17733 +        end;
2744 17734 +        else do;
2745 17735 +          NLeavesPerTree=NLeaves - PreviousN;
2746 17736 +          NLeavesBase = previousN;
2747 17737 +          previousN=Nleaves;
2748 17738 +        end;
2749 17740 +        output work.tempLeavesBase;
2750 17741 +        output work.tempLeavesInc;
2751 17742 +      run;
2752 17744 +      %EM_GETNAME(KEY=LEAFPLOT, TYPE=DATA);
2753 17745 +      data &EM_USER_LEAFPLOT;
2754 17746 +        length group $20;
2755 17747 +        set work.tempLeavesBase(in=_a rename=(NLeave
     sBase=NLeaves)) work.tempLeavesInc(rename=(NLeavesPerTree=N
     Leaves));
2756 17748 +        if _a then
2757 17749 +         group="%sysfunc(sasmsg(sashelp.dmine, rpt_b
     ase_vlabel,  NOQUOTE))";
2758 17750 +        else
2759 17751 +         group="%sysfunc(sasmsg(sashelp.dmine, rpt_i
```

```
     ncrement_vlabel,  NOQUOTE))";
2760 17752 +        label group="%sysfunc(sasmsg(sashelp.dmine,
     rpt_group_vlabel,  NOQUOTE))"
2761 17753 +             NLeaves = "%sysfunc(sasmsg(sashelp.dmi
     ne, rpt_nleaves_vlabel,  NOQUOTE))";
2762 17754 +      run;
2763 17756 +      proc datasets library=work nolist;
2764 17757 +        delete tempLeavesBase tempLeavesInc;
2765 17758 +      run;
2766 17759 +      quit;
2767 17760 +      %EM_REPORT(key=LEAFPLOT, viewtype=BAR, X=NTREE
     S, FREQ=NLEAVES, group=group, BLOCK=MODEL, Description=HPFO
     RESTLEAFPLOT, Autodisplay=Y);
2768 17761 +      %EM_REPORT(key=LEAFPLOT, where=%nrbquote(group
     ="%sysfunc(sasmsg(sashelp.dmine, rpt_increment_vlabel,  NOQ
     UOTE))"), viewtype=histogram, x=NLEAVES, BLOCK=MODEL, Descr
     iption=LEAFSTATS, Autodisplay=Y);
2769 17763 +   %end;
2770 17765 +   /* Variable Importance Table */
2771 17766 +   %EM_GETNAME(KEY=VARIMPORT, TYPE=DATA);
2772 17768 +   proc sort data=&EM_DATA_VARIABLESET out=tempvarse
     t(keep=NAME LABEL rename=(NAME=VARIABLE));
2773 17769 +     by NAME;
2774 17770 +     where ((ROLE='INPUT' and USE in('Y', 'D')) or R
     OLE='REJECTED' and USE='Y');
2775 17771 +   run;
2776 17772 +   data tempvarset;
2777 17773 +     length _upvar $32;
2778 17774 +     set tempvarset;
2779 17775 +     _upvar=upcase(variable);
2780 17776 +   run;
2781 17777 +   proc sort data=tempvarset; by _upvar ; run;
2782 17779 +   data &EM_USER_VARIMPORT; length _upvar $32; set &
     EM_USER_VARIMPORT; _upvar=upcase(variable); run;
2783 17780 +   proc sort data=&EM_USER_VARIMPORT; by _upvar; run
     ;
```

```
2784 17782 +   data &EM_USER_VARIMPORT;
2785 17783 +     merge &EM_USER_VARIMPORT(in=_a) tempvarset;
2786 17784 +     by _upvar;
2787 17785 +     if _a;
2788 17786 +     label Variable="%sysfunc(sasmsg(sashelp.dmine,
     meta_name_vlabel, NOQUOTE))"
2789 17787 +           NRules="%sysfunc(sasmsg(sashelp.dmine, rp
     t_nrules_vlabel, NOQUOTE))"
2790 17788 +            %if "%EM_TARGET_LEVEL" ne "INTERVAL" %th
     en %do;
2791 17789 +               Gini ="%sysfunc(sasmsg(sashelp.dmine,
      rpt_forestgini_vlabel, NOQUOTE))"
2792 17790 +               GiniOOB = "%sysfunc(sasmsg(sashelp.dm
     ine, rpt_forestginioob_vlabel, NOQUOTE))"
2793 17791 +               GiniValid = "%sysfunc(sasmsg(sashelp.
     dmine, rpt_forestginivalid_vlabel, NOQUOTE))"
2794 17792 +               Margin= "%sysfunc(sasmsg(sashelp.dmin
     e, rpt_forest_margin_vlabel, NOQUOTE))"
2795 17793 +               MarginOOB = "%sysfunc(sasmsg(sashelp.
     dmine, rpt_forest_marginoob_vlabel, NOQUOTE))"
2796 17794 +               MarginValid = "%sysfunc(sasmsg(sashel
     p.dmine, rpt_forest_marginvalid_vlabel, NOQUOTE))"
2797 17795 +               %if "&EM_PROPERTY_VARSELECT" eq "Y" a
     nd "&EM_PROPERTY_VIMETHOD" = "RBA" %then %do;
2798 17796 +                  MarginRBA = "%sysfunc(sasmsg(sashe
     lp.dmine, rpt_forest_marginrba_vlabel, NOQUOTE))"
2799 17797 +                  MSERBA = "%sysfunc(sasmsg(sashelp.
     dmine, rpt_forest_mserba_vlabel, NOQUOTE))"
2800 17798 +               %end;
2801 17799 +            %end;
2802 17800 +            %else %do;
2803 17801 +               MSE ="%sysfunc(sasmsg(sashelp.dmine,
     rpt_forestmse_vlabel, NOQUOTE))"
2804 17802 +               MSEOOB = "%sysfunc(sasmsg(sashelp.dmi
     ne, rpt_forestmseoob_vlabel, NOQUOTE))"
2805 17803 +               MSEValid = "%sysfunc(sasmsg(sashelp.d
```

```
     mine, rpt_forestmsevalid_vlabel, NOQUOTE))"
2806 17804 +               AAE= "%sysfunc(sasmsg(sashelp.dmine,
     rpt_forestaae_vlabel, NOQUOTE))"
2807 17805 +               AAEOOB = "%sysfunc(sasmsg(sashelp.dmi
     ne, rpt_forestaaeoob_vlabel, NOQUOTE))"
2808 17806 +               AAEValid = "%sysfunc(sasmsg(sashelp.d
     mine, rpt_forestaaevalid_vlabel, NOQUOTE))"
2809 17807 +               %if "&EM_PROPERTY_VARSELECT" eq "Y" a
     nd "&EM_PROPERTY_VIMETHOD" = "RBA" %then %do;
2810 17808 +                  AAERBA = "%sysfunc(sasmsg(sashelp.
     dmine, rpt_forest_aaerba_vlabel, NOQUOTE))"
2811 17809 +                  MSERBA = "%sysfunc(sasmsg(sashelp.
     dmine, rpt_forest_mserba_vlabel, NOQUOTE))"
2812 17810 +               %end;
2813 17811 +            %end;
2814 17812 +     ;
2815 17813 +     drop _upvar;
2816 17814 +   run;
2817 17815 +   proc sort data=&EM_USER_VARIMPORT; by descending
     NRULES; run;
2818 17816 +   %EM_REPORT(key=VARIMPORT, viewtype=DATA, block=MO
     DEL, description=IMPORTANCE, autodisplay=Y);
2819 17818 +   %em_checkmacro(name=EM_PROPERTY_MODELING, value=Y
     , global=Y);
2820 17819 +   %if "&EM_PROPERTY_MODELING"="Y" or ("&EM_PROPERTY
     _VARSELECT" eq "Y" and "&EM_PROPERTY_VIMETHOD" ne "LOSSREDU
     CTION") %then %do;
2821 17820 +       %em_getname(key=OUTMDLFILE, type=FILE, extens
     ion=bin);
2822 17821 +       /* Include in SPK but not report */
2823 17822 +       %EM_REPORT(viewtype=, key=OUTMDLFILE);
2824 17823 +   %end;
2825 17825 +   %symdel hpfst_score_input hpfst_score_output EM_U
     SER_OUTMDLFILE / nowarn;
2826 17827 +%Mend hpdm_Forest_report;
2827 NOTE: %INCLUDE (level 1) ending.
```

```
2828 NOTE: Fileref TEMP has been deassigned.
2829
2830 NOTE: There were 3 observations read from the data set EMWS
     3.HPDMFOREST_BASELINE.
2831 NOTE: The data set EMWS3.HPDMFOREST_BASELINE has 3 observat
     ions and 3 variables.
2832 NOTE: DATA statement used (Total process time):
2833       real time           0.01 seconds
2834       user cpu time       0.00 seconds
2835       system cpu time     0.00 seconds
2836       memory              599799.09k
2837       OS Memory           648792.00k
2838       Timestamp           07/01/2024 06:40:41 AM
2839       Step Count                        1  Switch Count  0
2840       Page Faults                       0
2841       Page Reclaims                     473
2842       Page Swaps                        0
2843       Voluntary Context Switches        36
2844       Involuntary Context Switches      0
2845       Block Input Operations            288
2846       Block Output Operations           264
2847
2848
2849
2850 NOTE: The data set WORK.EM_USER_REPORT has 132 observations
      and 4 variables.
2851 NOTE: DATA statement used (Total process time):
2852       real time           0.02 seconds
2853       user cpu time       0.02 seconds
2854       system cpu time     0.00 seconds
2855       memory              599799.09k
2856       OS Memory           648792.00k
2857       Timestamp           07/01/2024 06:40:41 AM
2858       Step Count                        1  Switch Count  0
2859       Page Faults                       0
2860       Page Reclaims                     216
```

```
2861       Page Swaps                          0
2862       Voluntary Context Switches          0
2863       Involuntary Context Switches        1
2864       Block Input Operations              0
2865       Block Output Operations             264
2866
2867
2868
2869 NOTE: There were 100 observations read from the data set EM
     WS3.HPDMFOREST_ITERATION.
2870 NOTE: The data set EMWS3.HPDMFOREST_ITERATION has 100 obser
     vations and 11 variables.
2871 NOTE: DATA statement used (Total process time):
2872       real time           0.01 seconds
2873       user cpu time       0.01 seconds
2874       system cpu time     0.00 seconds
2875       memory              599799.09k
2876       OS Memory           648792.00k
2877       Timestamp           07/01/2024 06:40:41 AM
2878       Step Count                          1  Switch Count  0
2879       Page Faults                         0
2880       Page Reclaims                       1380
2881       Page Swaps                          0
2882       Voluntary Context Switches          37
2883       Involuntary Context Switches        0
2884       Block Input Operations              288
2885       Block Output Operations             264
2886
2887
2888
2889 NOTE: There were 132 observations read from the data set WO
     RK.EM_USER_REPORT.
2890 NOTE: The data set WORK.EM_USER_REPORT has 264 observations
      and 4 variables.
2891 NOTE: DATA statement used (Total process time):
2892       real time           0.02 seconds
```

```
2893       user cpu time       0.03 seconds
2894       system cpu time     0.00 seconds
2895       memory              599799.09k
2896       OS Memory           648792.00k
2897       Timestamp           07/01/2024 06:40:41 AM
2898       Step Count                        1  Switch Count  0
2899       Page Faults                       0
2900       Page Reclaims                     199
2901       Page Swaps                        0
2902       Voluntary Context Switches        0
2903       Involuntary Context Switches      0
2904       Block Input Operations            0
2905       Block Output Operations           264
2906
2907
2908
2909 NOTE: There were 2 observations read from the data set EMWS
     3.HPDMFOREST_ITERATION.
2910 NOTE: DATA statement used (Total process time):
2911       real time           0.00 seconds
2912       user cpu time       0.00 seconds
2913       system cpu time     0.00 seconds
2914       memory              599799.09k
2915       OS Memory           648792.00k
2916       Timestamp           07/01/2024 06:40:41 AM
2917       Step Count                        1  Switch Count  0
2918       Page Faults                       0
2919       Page Reclaims                     61
2920       Page Swaps                        0
2921       Voluntary Context Switches        4
2922       Involuntary Context Switches      0
2923       Block Input Operations            0
2924       Block Output Operations           0
2925
2926
2927
```

```
2928 NOTE: There were 100 observations read from the data set EM
     WS3.HPDMFOREST_ITERATION.
2929 NOTE: There were 100 observations read from the data set EM
     WS3.HPDMFOREST_ITERATION.
2930 NOTE: There were 100 observations read from the data set EM
     WS3.HPDMFOREST_ITERATION.
2931 NOTE: The data set EMWS3.HPDMFOREST_ITERPLOT has 300 observ
     ations and 4 variables.
2932 NOTE: DATA statement used (Total process time):
2933       real time           0.01 seconds
2934       user cpu time       0.00 seconds
2935       system cpu time     0.00 seconds
2936       memory              599799.09k
2937       OS Memory           648792.00k
2938       Timestamp           07/01/2024 06:40:41 AM
2939       Step Count                        1  Switch Count  0
2940       Page Faults                       0
2941       Page Reclaims                     812
2942       Page Swaps                        0
2943       Voluntary Context Switches        14
2944       Involuntary Context Switches      0
2945       Block Input Operations            0
2946       Block Output Operations           264
2947
2948
2949
2950 NOTE: There were 264 observations read from the data set WO
     RK.EM_USER_REPORT.
2951 NOTE: The data set WORK.EM_USER_REPORT has 397 observations
      and 4 variables.
2952 NOTE: DATA statement used (Total process time):
2953       real time           0.02 seconds
2954       user cpu time       0.03 seconds
2955       system cpu time     0.00 seconds
2956       memory              599799.09k
2957       OS Memory           648792.00k
```

```
2958       Timestamp           07/01/2024 06:40:41 AM
2959       Step Count                        1  Switch Count  0
2960       Page Faults                       0
2961       Page Reclaims                     196
2962       Page Swaps                        0
2963       Voluntary Context Switches        0
2964       Involuntary Context Switches      0
2965       Block Input Operations            0
2966       Block Output Operations           520
2967
2968
2969
2970 NOTE: There were 397 observations read from the data set WO
     RK.EM_USER_REPORT.
2971 NOTE: The data set WORK.EM_USER_REPORT has 530 observations
      and 4 variables.
2972 NOTE: DATA statement used (Total process time):
2973       real time           0.02 seconds
2974       user cpu time       0.02 seconds
2975       system cpu time     0.00 seconds
2976       memory              599799.09k
2977       OS Memory           648792.00k
2978       Timestamp           07/01/2024 06:40:41 AM
2979       Step Count                        1  Switch Count  0
2980       Page Faults                       0
2981       Page Reclaims                     196
2982       Page Swaps                        0
2983       Voluntary Context Switches        0
2984       Involuntary Context Switches      0
2985       Block Input Operations            0
2986       Block Output Operations           520
2987
2988
2989
2990 NOTE: There were 100 observations read from the data set EM
     WS3.HPDMFOREST_ITERATION.
```

```
2991 NOTE: The data set WORK.TEMPLEAVESBASE has 100 observations
      and 2 variables.
2992 NOTE: The data set WORK.TEMPLEAVESINC has 100 observations
     and 2 variables.
2993 NOTE: DATA statement used (Total process time):
2994       real time           0.00 seconds
2995       user cpu time       0.00 seconds
2996       system cpu time     0.00 seconds
2997       memory              599799.09k
2998       OS Memory           648792.00k
2999       Timestamp           07/01/2024 06:40:41 AM
3000       Step Count                        1  Switch Count  0
3001       Page Faults                       0
3002       Page Reclaims                     193
3003       Page Swaps                        0
3004       Voluntary Context Switches        3
3005       Involuntary Context Switches      0
3006       Block Input Operations            0
3007       Block Output Operations           528
3008
3009
3010
3011 NOTE: There were 100 observations read from the data set WO
     RK.TEMPLEAVESBASE.
3012 NOTE: There were 100 observations read from the data set WO
     RK.TEMPLEAVESINC.
3013 NOTE: The data set EMWS3.HPDMFOREST_LEAFPLOT has 200 observ
     ations and 3 variables.
3014 NOTE: DATA statement used (Total process time):
3015       real time           0.01 seconds
3016       user cpu time       0.00 seconds
3017       system cpu time     0.01 seconds
3018       memory              599799.09k
3019       OS Memory           648792.00k
3020       Timestamp           07/01/2024 06:40:41 AM
3021       Step Count                        1  Switch Count  0
```

```
3022        Page Faults                          0
3023        Page Reclaims                        618
3024        Page Swaps                           0
3025        Voluntary Context Switches           15
3026        Involuntary Context Switches         0
3027        Block Input Operations               0
3028        Block Output Operations              264
3029
3030
3031
3032  NOTE: Deleting WORK.TEMPLEAVESBASE (memtype=DATA).
3033  NOTE: Deleting WORK.TEMPLEAVESINC (memtype=DATA).
3034
3035  NOTE: PROCEDURE DATASETS used (Total process time):
3036        real time            0.00 seconds
3037        user cpu time        0.01 seconds
3038        system cpu time      0.00 seconds
3039        memory               599799.09k
3040        OS Memory            648792.00k
3041        Timestamp            07/01/2024 06:40:41 AM
3042        Step Count                        1  Switch Count  0
3043        Page Faults                       0
3044        Page Reclaims                     49
3045        Page Swaps                        0
3046        Voluntary Context Switches        0
3047        Involuntary Context Switches      0
3048        Block Input Operations            0
3049        Block Output Operations           8
3050
3051
3052
3053  NOTE: There were 530 observations read from the data set WO
      RK.EM_USER_REPORT.
3054  NOTE: The data set WORK.EM_USER_REPORT has 662 observations
       and 4 variables.
3055  NOTE: DATA statement used (Total process time):
```

```
3056       real time           0.02 seconds
3057       user cpu time       0.02 seconds
3058       system cpu time     0.00 seconds
3059       memory              599799.09k
3060       OS Memory           648792.00k
3061       Timestamp           07/01/2024 06:40:41 AM
3062       Step Count                        1  Switch Count  0
3063       Page Faults                       0
3064       Page Reclaims                     196
3065       Page Swaps                        0
3066       Voluntary Context Switches        0
3067       Involuntary Context Switches      0
3068       Block Input Operations            0
3069       Block Output Operations           776
3070
3071
3072
3073  NOTE: There were 662 observations read from the data set WO
      RK.EM_USER_REPORT.
3074  NOTE: The data set WORK.EM_USER_REPORT has 795 observations
       and 4 variables.
3075  NOTE: DATA statement used (Total process time):
3076       real time           0.02 seconds
3077       user cpu time       0.02 seconds
3078       system cpu time     0.00 seconds
3079       memory              599799.09k
3080       OS Memory           648792.00k
3081       Timestamp           07/01/2024 06:40:41 AM
3082       Step Count                        1  Switch Count  0
3083       Page Faults                       0
3084       Page Reclaims                     228
3085       Page Swaps                        0
3086       Voluntary Context Switches        0
3087       Involuntary Context Switches      0
3088       Block Input Operations            0
3089       Block Output Operations           776
```

```
3090
3091
3092
3093 NOTE: There were 6 observations read from the data set EMWS
     3.HPDMFOREST_VARIABLESET.
3094       WHERE ((ROLE='INPUT') and USE in ('D', 'Y')) or ((ROL
     E='REJECTED') and (USE='Y'));
3095 NOTE: The data set WORK.TEMPVARSET has 6 observations and 2
      variables.
3096 NOTE: PROCEDURE SORT used (Total process time):
3097       real time           0.00 seconds
3098       user cpu time       0.00 seconds
3099       system cpu time     0.00 seconds
3100       memory              599799.09k
3101       OS Memory           648792.00k
3102       Timestamp           07/01/2024 06:40:41 AM
3103       Step Count                        1  Switch Count  0
3104       Page Faults                       0
3105       Page Reclaims                     151
3106       Page Swaps                        0
3107       Voluntary Context Switches        3
3108       Involuntary Context Switches      0
3109       Block Input Operations            0
3110       Block Output Operations           272
3111
3112
3113
3114 NOTE: There were 6 observations read from the data set WORK
     .TEMPVARSET.
3115 NOTE: The data set WORK.TEMPVARSET has 6 observations and 3
      variables.
3116 NOTE: DATA statement used (Total process time):
3117       real time           0.00 seconds
3118       user cpu time       0.00 seconds
3119       system cpu time     0.00 seconds
3120       memory              599799.09k
```

```
3121        OS Memory           648792.00k
3122        Timestamp           07/01/2024 06:40:41 AM
3123        Step Count                       1  Switch Count  0
3124        Page Faults                      0
3125        Page Reclaims                    127
3126        Page Swaps                       0
3127        Voluntary Context Switches       0
3128        Involuntary Context Switches     0
3129        Block Input Operations           0
3130        Block Output Operations          264
3131
3132
3133
3134 NOTE: There were 6 observations read from the data set WORK
     .TEMPVARSET.
3135 NOTE: The data set WORK.TEMPVARSET has 6 observations and 3
      variables.
3136 NOTE: PROCEDURE SORT used (Total process time):
3137        real time           0.00 seconds
3138        user cpu time       0.00 seconds
3139        system cpu time     0.00 seconds
3140        memory              599799.09k
3141        OS Memory           648792.00k
3142        Timestamp           07/01/2024 06:40:42 AM
3143        Step Count                       1  Switch Count  0
3144        Page Faults                      0
3145        Page Reclaims                    120
3146        Page Swaps                       0
3147        Voluntary Context Switches       0
3148        Involuntary Context Switches     0
3149        Block Input Operations           0
3150        Block Output Operations          264
3151
3152
3153
3154 NOTE: There were 6 observations read from the data set EMWS
```

```
     3.HPDMFOREST_VARIMPORT.
3155 NOTE: The data set EMWS3.HPDMFOREST_VARIMPORT has 6 observa
     tions and 9 variables.
3156 NOTE: DATA statement used (Total process time):
3157       real time           0.01 seconds
3158       user cpu time       0.00 seconds
3159       system cpu time     0.00 seconds
3160       memory              599799.09k
3161       OS Memory           648792.00k
3162       Timestamp           07/01/2024 06:40:42 AM
3163       Step Count                        1  Switch Count  0
3164       Page Faults                       0
3165       Page Reclaims                     128
3166       Page Swaps                        0
3167       Voluntary Context Switches        32
3168       Involuntary Context Switches      0
3169       Block Input Operations            0
3170       Block Output Operations           264
3171
3172
3173
3174 NOTE: There were 6 observations read from the data set EMWS
     3.HPDMFOREST_VARIMPORT.
3175 NOTE: The data set EMWS3.HPDMFOREST_VARIMPORT has 6 observa
     tions and 9 variables.
3176 NOTE: PROCEDURE SORT used (Total process time):
3177       real time           0.01 seconds
3178       user cpu time       0.00 seconds
3179       system cpu time     0.00 seconds
3180       memory              599799.09k
3181       OS Memory           648792.00k
3182       Timestamp           07/01/2024 06:40:42 AM
3183       Step Count                        1  Switch Count  0
3184       Page Faults                       0
3185       Page Reclaims                     118
3186       Page Swaps                        0
```

```
3187        Voluntary Context Switches        39
3188        Involuntary Context Switches      0
3189        Block Input Operations            288
3190        Block Output Operations           264
3191
3192
3193
3194  NOTE: There were 6 observations read from the data set EMWS
      3.HPDMFOREST_VARIMPORT.
3195  NOTE: There were 6 observations read from the data set WORK
      .TEMPVARSET.
3196  NOTE: The data set EMWS3.HPDMFOREST_VARIMPORT has 6 observa
      tions and 9 variables.
3197  NOTE: DATA statement used (Total process time):
3198        real time           0.01 seconds
3199        user cpu time       0.01 seconds
3200        system cpu time     0.00 seconds
3201        memory              599799.09k
3202        OS Memory           648792.00k
3203        Timestamp           07/01/2024 06:40:42 AM
3204        Step Count                        1  Switch Count  0
3205        Page Faults                       0
3206        Page Reclaims                     1082
3207        Page Swaps                        0
3208        Voluntary Context Switches        37
3209        Involuntary Context Switches      0
3210        Block Input Operations            288
3211        Block Output Operations           264
3212
3213
3214
3215  NOTE: There were 6 observations read from the data set EMWS
      3.HPDMFOREST_VARIMPORT.
3216  NOTE: The data set EMWS3.HPDMFOREST_VARIMPORT has 6 observa
      tions and 9 variables.
3217  NOTE: PROCEDURE SORT used (Total process time):
```

```
3218       real time           0.01 seconds
3219       user cpu time       0.00 seconds
3220       system cpu time     0.00 seconds
3221       memory              599799.09k
3222       OS Memory           648792.00k
3223       Timestamp           07/01/2024 06:40:42 AM
3224       Step Count                       1  Switch Count  0
3225       Page Faults                      0
3226       Page Reclaims                    115
3227       Page Swaps                       0
3228       Voluntary Context Switches       40
3229       Involuntary Context Switches     0
3230       Block Input Operations           288
3231       Block Output Operations          264
3232
3233
3234
3235 NOTE: There were 795 observations read from the data set WO
     RK.EM_USER_REPORT.
3236 NOTE: The data set WORK.EM_USER_REPORT has 927 observations
      and 4 variables.
3237 NOTE: DATA statement used (Total process time):
3238       real time           0.02 seconds
3239       user cpu time       0.02 seconds
3240       system cpu time     0.00 seconds
3241       memory              599799.09k
3242       OS Memory           648792.00k
3243       Timestamp           07/01/2024 06:40:42 AM
3244       Step Count                       1  Switch Count  0
3245       Page Faults                      0
3246       Page Reclaims                    229
3247       Page Swaps                       0
3248       Voluntary Context Switches       0
3249       Involuntary Context Switches     1
3250       Block Input Operations           0
3251       Block Output Operations          1032
```

```
3252
3253
3254
3255 NOTE: There were 927 observations read from the data set WO
     RK.EM_USER_REPORT.
3256 NOTE: The data set WORK.EM_USER_REPORT has 1059 observation
     s and 4 variables.
3257 NOTE: DATA statement used (Total process time):
3258       real time           0.02 seconds
3259       user cpu time       0.03 seconds
3260       system cpu time     0.00 seconds
3261       memory              599799.09k
3262       OS Memory           648792.00k
3263       Timestamp           07/01/2024 06:40:42 AM
3264       Step Count                        1  Switch Count  0
3265       Page Faults                       0
3266       Page Reclaims                     269
3267       Page Swaps                        0
3268       Voluntary Context Switches        0
3269       Involuntary Context Switches      0
3270       Block Input Operations            0
3271       Block Output Operations           1032
3272
3273
3274 17828
3275 17829  *-------------------------------------------------
     ---------*;
3276 17830  * End REPORT: HPDMForest;
3277 17831  *-------------------------------------------------
     ---------*;
3278
3279 17832  /* Reset EM Options */
3280 17833  options formchar="|----|+|---+=|-/\<>*";
3281 17834  options nocenter ls=256 ps=10000;
3282 17835  goptions reset=all device=GIF NODISPLAY;
3283
```

```
3284 17836  proc sort data=WORK.EM_USER_REPORT;
3285 17837  by ID VIEW;
3286 17838  run;
3287
3288 NOTE: There were 1059 observations read from the data set W
     ORK.EM_USER_REPORT.
3289 NOTE: The data set WORK.EM_USER_REPORT has 1059 observation
     s and 4 variables.
3290 NOTE: PROCEDURE SORT used (Total process time):
3291       real time           0.00 seconds
3292       user cpu time       0.00 seconds
3293       system cpu time     0.00 seconds
3294       memory              599799.09k
3295       OS Memory           648792.00k
3296       Timestamp           07/01/2024 06:40:42 AM
3297       Step Count                        1  Switch Count  0
3298       Page Faults                       0
3299       Page Reclaims                     252
3300       Page Swaps                        0
3301       Voluntary Context Switches        0
3302       Involuntary Context Switches      0
3303       Block Input Operations            0
3304       Block Output Operations           1032
3305
3306
3307 17839  proc sort data=EMWS3.Part2_CMeta_TRAIN out=WORK.SUBS
     ETINMETA;
3308 17840  by NAME;
3309 17841  run;
3310
3311 NOTE: There were 8 observations read from the data set EMWS
     3.PART2_CMETA_TRAIN.
3312 NOTE: The data set WORK.SUBSETINMETA has 8 observations and
      20 variables.
3313 NOTE: PROCEDURE SORT used (Total process time):
3314       real time           0.00 seconds
```

```
3315       user cpu time       0.00 seconds
3316       system cpu time     0.00 seconds
3317       memory              599799.09k
3318       OS Memory           648792.00k
3319       Timestamp           07/01/2024 06:40:42 AM
3320       Step Count                        1  Switch Count  0
3321       Page Faults                       0
3322       Page Reclaims                     152
3323       Page Swaps                        0
3324       Voluntary Context Switches        2
3325       Involuntary Context Switches      0
3326       Block Input Operations            0
3327       Block Output Operations           272
3328
3329
3330 17842  proc sort data=EMWS3.HPDMForest_VariableSet out=WORK
     .SUBSETVARSET(keep=NAME REPORT);
3331 17843  by NAME;
3332 17844  run;
3333
3334 NOTE: There were 8 observations read from the data set EMWS
     3.HPDMFOREST_VARIABLESET.
3335 NOTE: The data set WORK.SUBSETVARSET has 8 observations and
      2 variables.
3336 NOTE: PROCEDURE SORT used (Total process time):
3337       real time           0.00 seconds
3338       user cpu time       0.01 seconds
3339       system cpu time     0.00 seconds
3340       memory              599799.09k
3341       OS Memory           648792.00k
3342       Timestamp           07/01/2024 06:40:42 AM
3343       Step Count                        1  Switch Count  0
3344       Page Faults                       0
3345       Page Reclaims                     150
3346       Page Swaps                        0
3347       Voluntary Context Switches        4
```

```
3348        Involuntary Context Switches      0
3349        Block Input Operations            0
3350        Block Output Operations           272
3351
3352
3353  17845  data WORK.ASSESS_META;
3354  17846  merge WORK.SUBSETINMETA WORK.SUBSETVARSET;
3355  17847  by NAME;
3356  17848  run;
3357
3358  NOTE: There were 8 observations read from the data set WORK
      .SUBSETINMETA.
3359  NOTE: There were 8 observations read from the data set WORK
      .SUBSETVARSET.
3360  NOTE: The data set WORK.ASSESS_META has 8 observations and
      20 variables.
3361  NOTE: DATA statement used (Total process time):
3362        real time           0.00 seconds
3363        user cpu time       0.00 seconds
3364        system cpu time     0.00 seconds
3365        memory              599799.09k
3366        OS Memory           648792.00k
3367        Timestamp           07/01/2024 06:40:42 AM
3368        Step Count                        1  Switch Count  0
3369        Page Faults                       0
3370        Page Reclaims                     168
3371        Page Swaps                        0
3372        Voluntary Context Switches        0
3373        Involuntary Context Switches      0
3374        Block Input Operations            0
3375        Block Output Operations           264
3376
3377
3378  17849  data EM_temp_assessMeta;
3379  17850  set EMWS3.HPDMForest_CMeta_TRAIN;
3380  17851  where role in('DECISION', 'PREDICT', 'RESIDUAL', 'CL
```

```
     ASSIFICATION', 'ASSESS', 'COST');
3381 17852  run;
3382
3383 NOTE: There were 8 observations read from the data set EMWS
     3.HPDMFOREST_CMETA_TRAIN.
3384       WHERE role in ('ASSESS', 'CLASSIFICATION', 'COST', 'D
     ECISION', 'PREDICT', 'RESIDUAL');
3385 NOTE: The data set WORK.EM_TEMP_ASSESSMETA has 8 observatio
     ns and 21 variables.
3386 NOTE: DATA statement used (Total process time):
3387       real time           0.00 seconds
3388       user cpu time       0.00 seconds
3389       system cpu time     0.00 seconds
3390       memory              599799.09k
3391       OS Memory           648792.00k
3392       Timestamp           07/01/2024 06:40:42 AM
3393       Step Count                        1  Switch Count  0
3394       Page Faults                       0
3395       Page Reclaims                     129
3396       Page Swaps                        0
3397       Voluntary Context Switches        7
3398       Involuntary Context Switches      0
3399       Block Input Operations            288
3400       Block Output Operations           264
3401
3402
3403 17853  data EM_temp_assessdata;
3404 17854  set EMWS3.HPDMForest_TRAIN(keep=
3405 17855  F_IMP_Churn
3406 17856  I_IMP_Churn
3407 17857  P_IMP_Churn0
3408 17858  P_IMP_Churn1
3409 17859  R_IMP_Churn0
3410 17860  R_IMP_Churn1
3411 17861  U_IMP_Churn
3412 17862  _WARN_
```

```
3413 17863  IMP_Churn
3414 17864  );
3415 17865  run;
3416
3417 NOTE: There were 17497 observations read from the data set
     EMWS3.HPDMFOREST_TRAIN.
3418 NOTE: The data set WORK.EM_TEMP_ASSESSDATA has 17497 observ
     ations and 9 variables.
3419 NOTE: DATA statement used (Total process time):
3420       real time           0.00 seconds
3421       user cpu time       0.01 seconds
3422       system cpu time     0.00 seconds
3423       memory              599799.09k
3424       OS Memory           648792.00k
3425       Timestamp           07/01/2024 06:40:42 AM
3426       Step Count                        1  Switch Count  0
3427       Page Faults                       0
3428       Page Reclaims                     545
3429       Page Swaps                        0
3430       Voluntary Context Switches        4
3431       Involuntary Context Switches      0
3432       Block Input Operations            0
3433       Block Output Operations           2576
3434
3435
3436
3437
3438
3439
3440
3441
3442
3443
3444
3445
3446
```

```
3447
3448
3449
3450
3451 22147  data EM_temp_assessMeta;
3452 22148  set EMWS3.HPDMForest_CMeta_TRAIN;
3453 22149  where role in('DECISION', 'PREDICT', 'RESIDUAL', 'CL
     ASSIFICATION', 'ASSESS', 'COST');
3454 22150  run;
3455
3456 NOTE: There were 8 observations read from the data set EMWS
     3.HPDMFOREST_CMETA_TRAIN.
3457       WHERE role in ('ASSESS', 'CLASSIFICATION', 'COST', 'D
     ECISION', 'PREDICT', 'RESIDUAL');
3458 NOTE: The data set WORK.EM_TEMP_ASSESSMETA has 8 observatio
     ns and 21 variables.
3459 NOTE: DATA statement used (Total process time):
3460       real time           0.00 seconds
3461       user cpu time       0.00 seconds
3462       system cpu time     0.00 seconds
3463       memory              599799.09k
3464       OS Memory           648792.00k
3465       Timestamp           07/01/2024 06:40:42 AM
3466       Step Count                        1  Switch Count  0
3467       Page Faults                       0
3468       Page Reclaims                     127
3469       Page Swaps                        0
3470       Voluntary Context Switches        3
3471       Involuntary Context Switches      0
3472       Block Input Operations            0
3473       Block Output Operations           264
3474
3475
3476 22151  data EM_temp_assessdata;
3477 22152  set EMWS3.HPDMForest_VALIDATE(keep=
3478 22153  F_IMP_Churn
```

```
3479 22154  I_IMP_Churn
3480 22155  P_IMP_Churn0
3481 22156  P_IMP_Churn1
3482 22157  R_IMP_Churn0
3483 22158  R_IMP_Churn1
3484 22159  U_IMP_Churn
3485 22160  _WARN_
3486 22161  IMP_Churn
3487 22162  );
3488 22163  run;
3489
3490 NOTE: There were 7502 observations read from the data set E
     MWS3.HPDMFOREST_VALIDATE.
3491 NOTE: The data set WORK.EM_TEMP_ASSESSDATA has 7502 observa
     tions and 9 variables.
3492 NOTE: DATA statement used (Total process time):
3493       real time           0.00 seconds
3494       user cpu time       0.01 seconds
3495       system cpu time     0.00 seconds
3496       memory              599799.09k
3497       OS Memory           648792.00k
3498       Timestamp           07/01/2024 06:40:42 AM
3499       Step Count                        1  Switch Count  0
3500       Page Faults                       0
3501       Page Reclaims                     289
3502       Page Swaps                        0
3503       Voluntary Context Switches        4
3504       Involuntary Context Switches      0
3505       Block Input Operations            0
3506       Block Output Operations           1288
3507
3508
3509
3510
3511
3512
```

```
3513
3514
3515
3516
3517
3518
3519
3520
3521
3522
3523
3524 26454   %let _cn = %sysfunc(getoption(CENTER));
3525 26455   options nocenter;
3526 26456   proc print data=EMWS3.HPDMForest_EMREPORTFIT noobs
     label;
3527 26457   var STAT LABEL TRAIN
3528 26458   VALIDATE
3529 26459   ;
3530 26460   by TARGET TARGETLABEL;
3531 26461   title9 ' ';
3532 26462   title10 "%sysfunc(sasmsg(sashelp.dmine, rpt_fitstat
     _title  , NOQUOTE))";
3533 26463   run;
3534
3535 NOTE: There were 9 observations read from the data set EMWS
     3.HPDMFOREST_EMREPORTFIT.
3536 NOTE: The PROCEDURE PRINT printed page 9.
3537 NOTE: PROCEDURE PRINT used (Total process time):
3538       real time           0.00 seconds
3539       user cpu time       0.00 seconds
3540       system cpu time     0.00 seconds
3541       memory              599799.09k
3542       OS Memory           648792.00k
3543       Timestamp           07/01/2024 06:40:43 AM
3544       Step Count                        1  Switch Count  1
3545       Page Faults                       0
```

```
3546        Page Reclaims                     173
3547        Page Swaps                        0
3548        Voluntary Context Switches        6
3549        Involuntary Context Switches      0
3550        Block Input Operations            0
3551        Block Output Operations           0
3552
3553
3554 26464   title10;
3555 26465   options &_cn;
3556
3557 26466   proc sort data=EMWS3.HPDMForest_EMCLASSIFICATION no
     threads;
3558 26467   by DATAROLE TARGET TARGETLABEL;
3559 26468   run;
3560
3561 NOTE: There were 8 observations read from the data set EMWS
     3.HPDMFOREST_EMCLASSIFICATION.
3562 NOTE: The data set EMWS3.HPDMFOREST_EMCLASSIFICATION has 8
     observations and 12 variables.
3563 NOTE: PROCEDURE SORT used (Total process time):
3564        real time           0.01 seconds
3565        user cpu time       0.01 seconds
3566        system cpu time     0.01 seconds
3567        memory              599799.09k
3568        OS Memory           648792.00k
3569        Timestamp           07/01/2024 06:40:43 AM
3570        Step Count                        1  Switch Count  0
3571        Page Faults                       0
3572        Page Reclaims                     116
3573        Page Swaps                        0
3574        Voluntary Context Switches        27
3575        Involuntary Context Switches      0
3576        Block Input Operations            0
3577        Block Output Operations           264
3578
```

```
3579
3580 26469   %let _cn = %sysfunc(getoption(CENTER));
3581 26470   options nocenter;
3582 26471   proc print data=EMWS3.HPDMForest_EMCLASSIFICATION n
     oobs label;
3583 26472   var from into pct_row pct_col count percent
3584 26473   ;
3585 26474   by DATAROLE TARGET TARGETLABEL;
3586 26475   label FROM = "%sysfunc(sasmsg(sashelp.dmine, rpt_ta
     rget_vlabel ,     NOQUOTE))";
3587 26476   label INTO = "%sysfunc(sasmsg(sashelp.dmine, rpt_ou
     tcome_vlabel ,    NOQUOTE))";
3588 26477   label PCT_ROW = "%sysfunc(sasmsg(sashelp.dmine, rpt
     _targetpct_vlabel ,  NOQUOTE))";
3589 26478   label PCT_COL = "%sysfunc(sasmsg(sashelp.dmine, rpt
     _outcomepct_vlabel , NOQUOTE))";
3590 26479   label COUNT = "%sysfunc(sasmsg(sashelp.dmine, rpt_c
     ount_vlabel ,      NOQUOTE))";
3591 26480   label PERCENT = "%sysfunc(sasmsg(sashelp.dmine, rpt
     _totalpct_vlabel ,   NOQUOTE))";
3592 26481   where _TYPE_='PREDICTION';
3593 26482   title9 ' ';
3594 26483   title10 "%sysfunc(sasmsg(sashelp.dmine, rpt_classif
     ication_title    , NOQUOTE))";
3595 26484   run;
3596
3597 NOTE: There were 8 observations read from the data set EMWS
     3.HPDMFOREST_EMCLASSIFICATION.
3598       WHERE _TYPE_='PREDICTION';
3599 NOTE: The PROCEDURE PRINT printed page 10.
3600 NOTE: PROCEDURE PRINT used (Total process time):
3601       real time           0.00 seconds
3602       user cpu time       0.00 seconds
3603       system cpu time     0.00 seconds
3604       memory              599799.09k
3605       OS Memory           648792.00k
```

```
3606        Timestamp           07/01/2024 06:40:43 AM
3607        Step Count                        1  Switch Count  0
3608        Page Faults                       0
3609        Page Reclaims                     855
3610        Page Swaps                        0
3611        Voluntary Context Switches        11
3612        Involuntary Context Switches      0
3613        Block Input Operations            288
3614        Block Output Operations           0
3615
3616
3617 26485   title9;
3618 26486   title10;
3619 26487   options &_cn;
3620
3621 26488   %let _cn = %sysfunc(getoption(CENTER));
3622 26489   options nocenter;
3623 26490   data EMWS3.HPDMForest_EMEVENTREPORT;
3624 26491   length DATAROLE TARGET $32 TARGETLABEL $200 FALSENE
     VENT TRUENEVENT FALSEEVENT TRUEEVENT 8;
3625 26492   label DATAROLE = "%sysfunc(sasmsg(sashelp.dmine, rp
     t_datarole_vlabel ,    NOQUOTE))" TARGET = "%sysfunc(sasmsg
     (sashelp.dmine, rpt_target_vlabel ,      NOQUOTE))" TARGETL
     ABEL = "%sysfunc(sasmsg(sashelp.dmine, meta_targetlabel_vla
     bel, NOQUOTE))"
3626 26492 ! FALSEEVENT
3627 26493   = "%sysfunc(sasmsg(sashelp.dmine, rpt_falseevent_vl
     abel ,  NOQUOTE))" FALSENEVENT = "%sysfunc(sasmsg(sashelp.d
     mine, rpt_falsenevent_vlabel , NOQUOTE))" TRUEEVENT = "%sys
     func(sasmsg(sashelp.dmine, rpt_trueevent_vlabel ,   NOQUOTE
     ))" TRUENEVENT =
3628 26494      "%sysfunc(sasmsg(sashelp.dmine, rpt_truenevent_v
     label ,  NOQUOTE))";
3629 26495   FALSEEVENT=0;
3630 26496   FALSENEVENT=0;
3631 26497   TRUEEVENT=0;
```

```
3632 26498   TRUENEVENT=0;
3633 26499   set EMWS3.HPDMForest_EMEVENTREPORT;
3634 26500   run;
3635
3636 NOTE: There were 2 observations read from the data set EMWS
     3.HPDMFOREST_EMEVENTREPORT.
3637 NOTE: The data set EMWS3.HPDMFOREST_EMEVENTREPORT has 2 obs
     ervations and 7 variables.
3638 NOTE: DATA statement used (Total process time):
3639       real time           0.01 seconds
3640       user cpu time       0.00 seconds
3641       system cpu time     0.00 seconds
3642       memory              599799.09k
3643       OS Memory           648792.00k
3644       Timestamp           07/01/2024 06:40:43 AM
3645       Step Count                        1  Switch Count  0
3646       Page Faults                       0
3647       Page Reclaims                     926
3648       Page Swaps                        0
3649       Voluntary Context Switches        35
3650       Involuntary Context Switches      0
3651       Block Input Operations            288
3652       Block Output Operations           264
3653
3654
3655 26501   proc print data=EMWS3.HPDMForest_EMEVENTREPORT noob
     s label;
3656 26502   title9 ' ';
3657 26503   title10 "%sysfunc(sasmsg(sashelp.dmine, rpt_eventta
     ble_title    , NOQUOTE))";
3658 26504   by notsorted DATAROLE notsorted TARGET notsorted TA
     RGETLABEL;
3659 26505   run;
3660
3661 NOTE: There were 2 observations read from the data set EMWS
     3.HPDMFOREST_EMEVENTREPORT.
```

```
3662 NOTE: The PROCEDURE PRINT printed page 11.
3663 NOTE: PROCEDURE PRINT used (Total process time):
3664       real time           0.00 seconds
3665       user cpu time       0.01 seconds
3666       system cpu time     0.00 seconds
3667       memory              599799.09k
3668       OS Memory           648792.00k
3669       Timestamp           07/01/2024 06:40:43 AM
3670       Step Count                        1  Switch Count  0
3671       Page Faults                       0
3672       Page Reclaims                     169
3673       Page Swaps                        0
3674       Voluntary Context Switches        13
3675       Involuntary Context Switches      0
3676       Block Input Operations            288
3677       Block Output Operations           0
3678
3679
3680 26506   title10;
3681 26507   options &_cn;
3682
3683 26508   proc datasets library=EMWS3 nolist;
3684 26509   modify HPDMForest_EMRANK;
3685 26510   label target = "%sysfunc(sasmsg(sashelp.dmine, rpt_
     targetvar_vlabel ,   NOQUOTE))";
3686 26511   label datarole = "%sysfunc(sasmsg(sashelp.dmine, rp
     t_datarole_vlabel ,    NOQUOTE))";
3687 26512   run;
3688
3689 NOTE: MODIFY was successful for EMWS3.HPDMFOREST_EMRANK.DAT
     A.
3690 26513   quit;
3691
3692 NOTE: PROCEDURE DATASETS used (Total process time):
3693       real time           0.00 seconds
3694       user cpu time       0.00 seconds
```

```
3695        system cpu time     0.01 seconds
3696        memory              599799.09k
3697        OS Memory           648792.00k
3698        Timestamp           07/01/2024 06:40:43 AM
3699        Step Count                        1  Switch Count  0
3700        Page Faults                       0
3701        Page Reclaims                     348
3702        Page Swaps                        0
3703        Voluntary Context Switches        10
3704        Involuntary Context Switches      0
3705        Block Input Operations            0
3706        Block Output Operations           536
3707
3708
3709 26514   %let _cn = %sysfunc(getoption(CENTER));
3710 26515   options nocenter;
3711 26516   proc print data=EMWS3.HPDMForest_EMRANK label noobs
     ;
3712 26517   var
3713 26518   decile gain lift liftc resp respc N _meanP_;
3714 26519   by
3715 26520   notsorted DATAROLE
3716 26521   notsorted TARGET
3717 26522   notsorted TARGETLABEL
3718 26523   ;
3719 26524   title9 ' ';
3720 26525   title10 "%sysfunc(sasmsg(sashelp.dmine, rpt_scorera
     nking_title , NOQUOTE))";
3721 26526   run;
3722
3723 NOTE: There were 40 observations read from the data set EMW
     S3.HPDMFOREST_EMRANK.
3724 NOTE: The PROCEDURE PRINT printed page 12.
3725 NOTE: PROCEDURE PRINT used (Total process time):
3726        real time           0.00 seconds
3727        user cpu time       0.00 seconds
```

```
3728        system cpu time     0.00 seconds
3729        memory              599799.09k
3730        OS Memory           648792.00k
3731        Timestamp           07/01/2024 06:40:43 AM
3732        Step Count                        1  Switch Count  0
3733        Page Faults                       0
3734        Page Reclaims                     172
3735        Page Swaps                        0
3736        Voluntary Context Switches        12
3737        Involuntary Context Switches      0
3738        Block Input Operations            544
3739        Block Output Operations           0
3740
3741
3742 26527   title10;
3743 26528   options &_cn;
3744
3745 26529   proc datasets library=EMWS3 nolist;
3746 26530   modify HPDMForest_EMSCOREDIST;
3747 26531   label target = "%sysfunc(sasmsg(sashelp.dmine, rpt_
     targetvar_vlabel ,      NOQUOTE))";
3748 26532   label datarole = "%sysfunc(sasmsg(sashelp.dmine, rp
     t_datarole_vlabel ,    NOQUOTE))";
3749 26533   run;
3750
3751 NOTE: MODIFY was successful for EMWS3.HPDMFOREST_EMSCOREDIS
     T.DATA.
3752 26534   quit;
3753
3754 NOTE: PROCEDURE DATASETS used (Total process time):
3755        real time           0.01 seconds
3756        user cpu time       0.01 seconds
3757        system cpu time     0.00 seconds
3758        memory              599799.09k
3759        OS Memory           648792.00k
3760        Timestamp           07/01/2024 06:40:43 AM
```

```
3761        Step Count                          1  Switch Count  0
3762        Page Faults                         0
3763        Page Reclaims                       344
3764        Page Swaps                          0
3765        Voluntary Context Switches          10
3766        Involuntary Context Switches        0
3767        Block Input Operations              0
3768        Block Output Operations             536
3769
3770
```