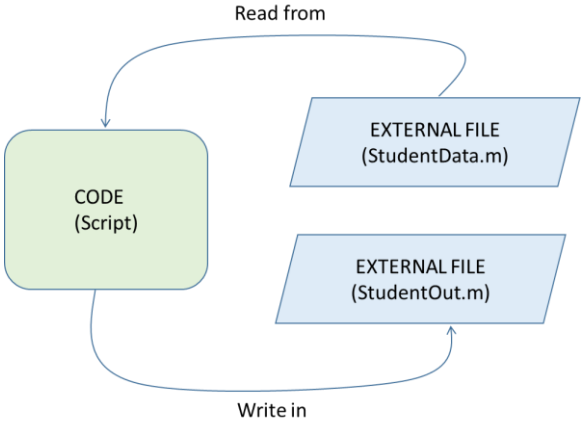
INPUT/OUTPUT FROM/TO EXTERNAL FILES

Functions used: textscan, cell2mat, randperm, fopen, fprintf (file: 'Input_Output External FILES-textscan function-V3.pdf')




```
% RSData.m (ReadStudentData)
% Teaches you how to
%   (1) read data of different types into common matlab data structures.
%   (2) Also how to generate fake data to test simulations and models, e.g., by shuffling and sorting
%   (3) output (write) formatted data (results) in external files

clc, clear

FID = fopen('studentDATA.m');          %  input.  It does need the 'r' (reading mode). You can use it.
FID2= fopen('studentOut.m','w');       %  output. It need the 'w' mode

CSD = textscan(FID,'%d %s %d %s %s %s %f %s','CommentStyle','%');          % CSD, cell student data

%% Transfer data to new variables
List = cell2mat(CSD(:,1));          % List number is array of integers
Sect=cell2mat(CSD{:,2});            % Sect is character array (each element has same length)

%% SN is an array of integers
SN=cell2mat(CSD(:,3));              % Values transferred
SN= SN(randperm(numel(SN)));        % SN is shuffled
SN=100000001+SN;                    % original SN is modified adding an arbitrary number to hide
                                    % student data original

%% First name
NAME=CSD{:,4};                      % names remain cell arrays, i.e., don't use cell2mat function
MNAME=CSD{:,5};                     % as names have different lengths

%% Last Name 1
LNAME1=CSD{:,6};
LNAME1=LNAME1(randperm(numel(LNAME1)));          % LNAME1 is shuffled

%% Last Name 2
LNAME2=CSD{:,7};
```

```
LNAME2=LNAME2(randperm(numel(LNAME2)));          % LNAME2 is shuffled

%% Final Score and Grade
FSCORE=cell2mat(CSD(:,8));
GRADE=cell2mat(CSD{:,9});

%% OUTPUT in external file
for ii=1:numel(ListNo)
   fprintf(FID2, '%3d %4s %9d %12s %2s %11s %11s %4.0f %2s \n', ListNo(ii),Sect(ii,:),...
      SN(ii),NAME{ii},MNAME{ii},LNAME1{ii},LNAME2{ii},...
      FSCORE(ii),GRADE(ii));
end

fclose(FID);
fclose(FID2);
```

StudentDATA.m (Code reads from this file ignoring first line of code, i.e., the data title). You must construct the file below (i.e., copy/paste) before attempting to run the code above.

```
% List  Sect  SN            NAME    MNAME   LNAME1       LNAME2     FSCORE   GRADE
  1   096  902142113       MELWIN   X     SANABRIA    FERNANDEZ    86   B
  2   096  902156009     KENDRICK   M        LAZU     FRAGUADA    96   A
  3   096  902167113        MARCO   S       PEREZ        VIERA    50   F
  4   096  902150453      MICHAEL   A   DOMINGUEZ      XILENIA    95   A
  5   096  902160161       NAHOMY   M      MEDINA       TORRES    67   D
  6   096  902161945         JOEL   D      MORELL    GONZALEZ     97   A
  7   096  902154260    ROBERTICO   X        RIOS       JURADO     3   W
  8   096  541143497      ALONDRA   Y       GOYCO    GONZALEZ     53   D
  9   096  902141889     ZUIZHELO   M      ROSADO       TORRES    61   D
 10   096  902150537        DARIO   A       ZAYAS    GONZALEZ     69   D
 11   096  902143869         JANN   C      SANTOS       FERRER    99   A
 12   096  902165553      HILLARY   F   HERNANDEZ      RAMIREZ    99   A
 13   096  902167025     PAOLINHA   N      TORRES       ROMAN     82   B
 14   096  902090329       MONICA   X     VAZQUEZ       MARTIR    69   D
 15   096  902153157     NEWISHKA   E       LOPEZ    MONSANTO     26   F
 16   096  902155241       MANUEL   O  VILLANUEVA       GARCIA    38   W
 17   096  902162881      DANIELA   X   HERNANDEZ    GONZALEZ     54   D
 18   096  902163973     VERONICA   A        RUIZ         POU     44   F
 19   096  902160357      BREANIA   M     GUILLEN       CASTRO    87   B
 20   096  902166025      ENRIQUE   X      APONTE        LOPEZ   100   A
 21   096  902150937   MARICELLIS   X   HERNANDEZ         SOTO    37   W
 22   096  902167521        ANGEL   G      FLORES    GONZALEZ     87   B
 23   096  944163564        DYLAN   O       RAMOS       COLON    81   B
 24   096  902167753      BRYANHO   Y       PEREZ    RODRIGUEZ    85   B
 25   106  902165375      JAIRANO   O        CRUZ       COLON    60   D
 26   106  902161073         FELIX  J      AGUIAR      SANTANA    23   W
 27   106  902165829     PALONDRA   V   HERNANDEZ    DEL-MORAL    65   D
 28   106  902172338    GAVRIELLA   M     NOGUERA      ARGUETA    28   F
 29   106  902164969      SAMUELO   J     PANTOJA    HERNANDEZ    98   A
 30   106  902171193         JUAN   M     PANTOJA     ANTACCIO    96   A
```

StudentOut.m: Student Output is printed in an external file with some shuffled columns. The format is the same as above.

PROGRAM EXPLANATION

What type of data is each variable? It is very important you inspect the Workspace window to understand variable data type of each one. For example: Sect (stand for Section) is treated as 30x3-2D character array (rectangular array). NAME is a cell array of strings. Use cell arrays when words are of different lengths.

TEXTSCAN is in charge of reading the data in the file studentDATA.m. Data must be arranged column-wise, i.e., each element in a column must be of same data type. FID is a file-handler (i.e., a pointer); it works to identify the file studentDATA.m. FID complies with matlab name construction (can be any name), while studentDATA.m complies with the operating system name construction rules (e.g., windows 10). The different reading commands, e.g., %d %s, work to specify into what type of data the particular record will be read into, e.g., %d reads integers, %s reads strings, %f reads double. 'CommentStyle','%' makes the reading ignoring the first row of data (i.e., the data title). You can use >>whos CSD to learn what type of data is CSD (try it also with different variables).

In this code we transfer data initially read as elements of cell array itno simpler data structures, just because they are easier to handle (less indexing operators). Not all data is transferred, e.g., names which are of different lenghts remain cell elements, the easier way to handle them.

CELL2MAT converts cell array element into an ordinary array of the type of the data. For example, List = cell2mat(CSD(:,1)); % List is an array of integers. While in Sect=cell2mat(CSD{:,2}); % Sect is character array (each element has same length).

RANDPERM shuffle data randomly (here by shuffling the element's index). `p = randperm(n)` returns a row vector containing a random permutation of the integers from 1 to `n` inclusive. In our code SN= SN(randperm(numel(SN))); % SN is shuffled randomly from 1 to numel(SN)

WRITING INTO EXTERNAL FILES: The process of writing into external files involve three functions: fopen, fprintf, fclose. The code uses fopen which opens and prepares the file to write into with 'w' as permission. (other permissions are available https://www.mathworks.com/help/matlab/ref/fopen.html#btrnibn-1-permission). FID2 is a function handler to identify studentOut.m. Afterwards each fprintf for output needs FID2 as the first argument, this implies where the fprintf wants to print into (for our case studentOut.m). FCLOSE. Every file that is open (with fopen) must be closed with fclose (stands for file close)

EXERCISES (you can use library functions)

(1) Write a program to count and report students passing the **Vegetarian Cooking Class (VEGI-101)**. Passing grade is 70% or more. Output contains one table with student data, and PASS/NOTPASS column
(2) Write a program to count and report students whose last name starts with 'R' or 'P'
(3) Write a program to sort student data by descending grades (from highest to lowest).
(4) Write a program to count (and classify?) the students by program majors. Possibilities are: XXX