Portfolio Component 1: Data Exploration

Objectives:

- In class, we covered how to do data exploration with statistical functions in R
- In this assignment, you recreate that functionality in C++ code
- This will prepare us to write algorithms in C++ in future assignments

Turn in:

- Upload your C++ code and document to your portfolio, and create a link to it on your index page
- Upload your C++ code and document to eLearning

Instructions:

1. In the C++ IDE of your choice:
    a. Read the csv file (now reduced to 2 columns) into 2 vectors of the appropriate type. See the “reading in cpp” picture at the end of the document.
    b. Write the following functions:
        1. a function to find the sum of a numeric vector
        2. a function to find the mean of a numeric vector
        3. a function to find the median of a numeric vector
        4. a function to find the range of a numeric vector
        5. a function to compute covariance between rm and medv (see formula on p. 74 of pdf)
        6. a function to compute correlation between rm and medv (see formula on p. 74 of pdf); Hint: sigma of a vector can be calculated as the square root of variance(v, v)
    c. Call the functions described in 1-4 for rm and separately for medv. Call the covariance and correlation functions for rm and medv together. Print results for each function.
2. Write a short document:
    a. copy/paste runs of your code showing the output
    b. describing your experience using built-in functions in R versus coding your own functions in C++
    c. describe the descriptive statistical measures mean, median, and range, and how these values might be useful in data exploration prior to machine learning
    d. describe the covariance and correlation statistics, and what information they give about two attributes. How might this information be useful in machine learning?
3. Create a link to this document and your code on your index page.

```
Caution:  All course work is run through plagiarism detection software comparing
students’ work as well as work from previous semesters and other sources.
```

Grading Rubric:

Element	Points
Step 1 C++ code	70
Step 2 Overview document	20
Step 3 Create links to the document and code on the index page	10
Total	100

Grading Rubric:

- 90 and above for exceptional work
- 80-89 for good work
- 70-79 for average work
- below 70 for low quality work

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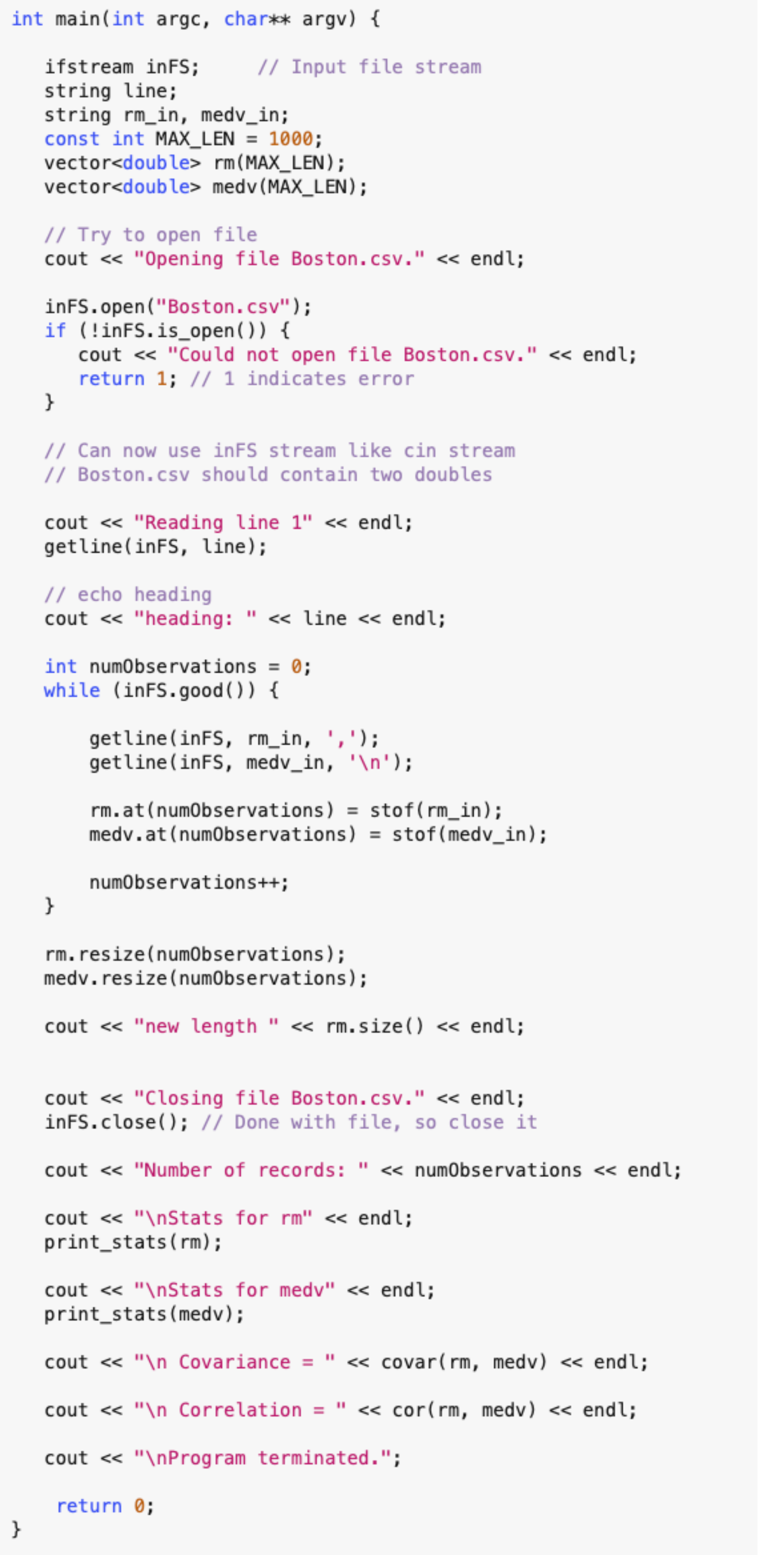
One way to read in a csv file in C++, feel free to do this another way if you prefer



```cpp
int main(int argc, char** argv) {

   ifstream inFS;     // Input file stream
   string line;
   string rm_in, medv_in;
   const int MAX_LEN = 1000;
   vector<double> rm(MAX_LEN);
   vector<double> medv(MAX_LEN);

   // Try to open file
   cout << "Opening file Boston.csv." << endl;

   inFS.open("Boston.csv");
   if (!inFS.is_open()) {
      cout << "Could not open file Boston.csv." << endl;
      return 1; // 1 indicates error
   }

   // Can now use inFS stream like cin stream
   // Boston.csv should contain two doubles

   cout << "Reading line 1" << endl;
   getline(inFS, line);

   // echo heading
   cout << "heading: " << line << endl;

   int numObservations = 0;
   while (inFS.good()) {

       getline(inFS, rm_in, ',');
       getline(inFS, medv_in, '\n');

       rm.at(numObservations) = stof(rm_in);
       medv.at(numObservations) = stof(medv_in);

       numObservations++;
   }

   rm.resize(numObservations);
   medv.resize(numObservations);

   cout << "new length " << rm.size() << endl;


   cout << "Closing file Boston.csv." << endl;
   inFS.close(); // Done with file, so close it

   cout << "Number of records: " << numObservations << endl;

   cout << "\nStats for rm" << endl;
   print_stats(rm);

   cout << "\nStats for medv" << endl;
   print_stats(medv);

   cout << "\n Covariance = " << covar(rm, medv) << endl;

   cout << "\n Correlation = " << cor(rm, medv) << endl;

   cout << "\nProgram terminated.";

    return 0;
}
```

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