DA 203: Introduction to computing for artificial intelligence and machine learning 2:1

[1]

Instructions

1. `Published Date: 20-Jan-2022`
2. `Submission Date: 28-Jan-2022`
3. Codes should be original and should not be copied from others, including fellow participants.
4. Plagiarised reports/codes results in zero mark.
5. Weightage of problem set 1 is 8%

Problem-1: Roofline analysis
Describe Roofline analysis. Describe/analyse Arithmatic intensity in the context of sparse matrix(in CSR - compressed sparse row format) multiplication vs dense matrix multiplication. **[10 Points]**

Bonus points. Perform Roofline analysis(Intel® advisor) on a sample numerical algorithm/function (ex: matrix multiplication) and describe the observations. **[5 Points]**

Problem-2: Inheritance
Demonstrate Inheritence by taking your favorite example in your favorite programming language supporting OOP. **[10 Points]**

Problem-3:
Read the following code snippet and answer the questions below. **[10 Points]**

```
1 #include <iostream>
2
3 using namespace std;
4 class base {
5     public:
6       virtual void print()
7       {
8             cout << "print base class" << endl;
9       }
10
11      void show()
12      {
13            cout << "show base class" << endl;
14      }
15 };
16
17 class derived : public base {
18     public:
19       void print()
```

[1] Problem set 1

```
20      {
21            cout << "print derived class" << endl;
22      }
23      void print(int x)
24      {
25                  cout << x << endl;
26      }
27 };
28
29 int main()
30 {
31      base b;
32      derived d;
33      b.print();
34      b.show();
35      d.print();
32      d.show();
33 }
```

1. What is 'public', 'private' and 'protected' in C++? In line number 17, why is the word 'public' used?
2. What is a virtual function? Why is function 'print' declared as virtual in line number 6, but not in line number 19?
3. What is inheritance? Explain with respect to the above code.
4. What is polymorphism? Does the above code contain an instance of polymorphism?
5. What will be the output of the code?

Problem-3:
write a python code which converts an 8 bit floating point number in IEEE precision(1 sign bit, 4 exponent bits, 3 mantissa bits) into a decimal representation. **[10 Points]**

For eg : 0 0111 010 $--> 1.25$, 0 0111 000 $--> 1$

Hint : Here f is the decimal value represented by the floating bits and exp is the decimal value represented by exponent bits. The bias for this representation is $2^{4-1} - 1 = 8$. $E = exp - bias$. The final decimal value is given by $2^E(1 + f)$

Submission Instructions

- Problem 4 should be written and submitted in the quiz section of moodle page (Coderunner type quiz).
- Submit the answers as PDF in the moodle page(Descriptive assignment type).