

ECE 448/528 – Application Software Design

HOMEWORK #1

Due date: Thursday, February 6th, 2025, 11:59 PM

Note: do not use generative AI tools for the homework assignment below. Do your own research to answer questions below.

1. Execute the commands `ifconfig` and `route -n` inside the course VM. Answer the following questions based on the output *(10 points)*
 - i) How many network interfaces are there and what are their names?
 - ii) List the MAC addresses of the network interfaces if there are any
 - iii) What are the IP addresses and subnets associated with each interface?
 - iv) How many rules are there in the routing table? What is the address of the default gateway?
 - v) Which rule will apply if we need to send a packet to the default gateway?
2. Research TCP and UDP header formats and explain why UDP is considered a lighter protocol than TCP in terms of packet size. *(10 points)*
3. Why is DHCP required on a network? In what type of network would DHCP be beneficial? Research and explain how DHCP efficiently allocates IP addresses on a network. *(10 points)*
4. Assume that `StringBuilder` is unavailable for reversing the string (refer to the `ReverseString` class in Lecture 5). Write Java code to reverse the string without utilizing any libraries. Your function should identify the encoding scheme of the string. Assume there are only two types: UTF-8 and UTF-16. You may need to research about how UTF-8 and UTF-16 encode strings. *(10 points)*