

MP 732, CT Lecture 3, CT Applications

Due Friday April 5th, 2019 at 11:59 PM on Sakai

Please cite any external materials that you reference in completing the homework

May 11, 2020

Problem 1. List commonly used CT contrast agents including *oral agents* as well as *intravenous agents* and describe their properties. Give examples of CT exams that would use these contrast agents and which mechanism (oral vs. IV) is preferred and explain why that is the case.

Problem 2. Cardiac CT is commonly used for imaging of atherosclerotic plaques, but it is not the only modality that is capable of doing so. Which other modalities can be used with reasonable efficacy for this task? What are the strengths and weaknesses of the other modalities compared to CT? Be sure to explicitly quantify the spatial resolution, contrast resolution, and temporal resolution of each modality.

Problem 3. In cardiac CT, some phases of the cardiac cycle are more diagnostically useful than others. Which phase is typically the one of interest in imaging? Why is this the case? How is this phase “separated” from the others?

Problem 4. Describe the CT parameters that directly affect the *time* that is required to obtain an image of the heart. List reasonable values in cardiac CT for each of these parameters and compare them to values that might reasonably be found in abdomen/pelvis and head exams.

Problem 5. Explain the purpose of and generally describe the process of CT perfusion imaging. Which organs are most commonly the subject of perfusion studies and why?

Problem 6. The perfusion model discussed in class includes arterial input to an organ and venous output from it. Give an example of an organ that can be adequately modeled with this method. Give an example of an organ that *does not* have only arterial input and only venous output, and hence cannot be adequately modeled in this way. Describe what the contrast concentration vs. time curve would look like for the organ you choose and sketch it (arbitrary units on the axes are fine). Does the contrast vs. time curve for organs with more complex blood supply suggest that any changes might be necessary in the acquisition process?