Jiang - Lecture 6 - Towards Quantitative Imaging

- Quantitative stuff about imaging
    - CT number is atten coefficient, etc.
    - we model physics and these things have physical meaning
- Qualitative nature of image interpretation
    - binary diagnostic description
    - No bayesian probability estimation
    - Are radiologists bayesian decision makers? (I guess not…?)
    - CT and MRI are not quantitatively compatible between machines of different manufactures
- Disadvantage of qualitative
    - much missed opportunity
    - also - qualitative IS WORKING
        - quantitative not necessarily that much better
- CAD
    - CADe - help radiologists identify missing cancers
        - rationale:
            - human observers miss sometimes obvious cancers
                - like losing car keys - once you find it, you realize it's in plain sight
            - utility is akin to spell-check
        - issues
            - computer produces large number of false positive
            - disconnect between radiologists and the computer aid
                - imagine working with spell check with lots of false positives
                - you would tend to ignore it
    - CADx - help diagnose cancer versus benign lesions, etc.
        - rationale:
            - difficult for radiologists to consider multiple cues (features) in a Bayesian sense
            - Computer aid estimates the odds (likelihood) to help radiologists make decision
        - issues
            - difficult for radiologists to interpret computer results
            - disconnects between radiologists and the computer aid
                - black box - can't ask "why do you think that"
    - Overview of development
        - UChicago started in late 1980s
        - early non-acceptance
        - double-reading by two radiologists
            - in Europe, study showed it helped
        - quick clinical adoption (detection not diagnosis)
        - inconsistent clinical-study results
        - back-lash of criticism
        - Hard to talk about w screening - small numbers