AI and Human Health: Imaging, Human-Computer Interactions, and Data Visualization

Participants

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Assets

- **Kim Powell (KP) – Asst. Prof. – Clinical; Dir. Small Animal Imaging Core DHLRI and Shared Resource CCC**
  - Expertise in clinical imaging and image analysis
  - Availability of true clinical datasets in patients populations
  - Setting up workflows for digital image pre-processing
  - Interface between AI experts and users
- **Jian Chen (JC) – Assoc. Prof.; Dir. OSU Visual Computing Lab**
  - Expertise in visual computing and data science
  - Discipline bridging: understands human and machine sides of human-computer interactions
  - Building workflows to tweak codes/look at data
  - Tools (combining spatial & non-spatial data, GIS)
- **Frank Norris (FN) – Sr. Tech Licensing Manager**
  - Aware of many applications of ML & AI across OSU campus (COM, COE, Ag.)
  - Assess discoveries to determine translation to industry
  - Provide worldwide landscape advantage for new research
- **Deepak Gulati (DG) – Prof.; Dir. of OSU Telestroke Collaborative**
  - Clinician with expertise in stroke
  - Reverse translation perspective for practical applications
  - (Stroke) patient population and clinical PACS datasets (IMR, CT, OCT, Xray, angiogram)

    - Animals models (cats, mice and other small animals)
    - ORIEN data sharing across universities
    - Brain Tissue bank at OSU
- **Lanchun Lu (LL) — Assoc. Prof. – Clinical; Medical physicist**
    - Research interest in image guided radiation therapy for cancer
    - Brain imaging patient data
    - Expertise in optical coherence tomography (OCT)
    - International networks (through China Gateway)
- **Alper Yilmaz (AY) — Prof.**
    - Expertise in computational models for imaging and video understanding
    - AI tools (some are application-based)
    - Hardware, soft computing space
    - Sensors and calibration

Link and Leverage Our Big Ideas (Looking for top three)

- **Improving risk analysis for stroke patients**
    - DG: Need to be able to discern stroke patients who would benefit from TPA ((tissue plasminogen activator) and those that would not; Dual energy imaging for (suspected) stroke – OSU has protocol in place where all patients in ER get dual energy scan; OSU also has access to all clinical imaging data (beyond stroke)

    Can we predict stroke from imaging? Can we gather info from screening of high risk populations? Enhance predictive powers of screening with AI?

    - AP: prediction of power plant failure using historical data that is used to predict several months into the future; AI/DL systems look at transients and markers in the data and uses data fro9m simulations and exercises done with real plants
    - AP: To expand to humans in this regard, would need historical data for each person…how do we get a training dataset? Is there a dataset that would be historical for stroke/vascular patients? Are there common markers that relate to stroke?
    - DG: stroke treatment is very time sensitive (acute care setting); for acute CT scans, 120 (minutes -?) is validated while 80 and 140 are not
    - DG: to prevent death and major disability, need objective criteria and accuracy, uniformity of measurements
    - Some companies have worked on markers
    - Skema Smith (cardiologist: developed and working into assay a leading indicator of stroke…working with pharmacologist and developing a product (need to get into trials)
    - Perhaps integrated into MLA workup – could be put into mix today before validated and approved\Would this be impactful to clinicians? Yes: current software reveals bleeding (or not). E.g., TPA is associated with risk of bleeding, 30% of patients getting TPA are not having a stroke…need help with image processing. Clinicians are asking more from images….can apply after we know more information
    - Including additional variables into risk analysis is a more tractable problem

    Image annotation (for stroke and other diseases)

- KP: MR images can be accessed from Radiology, but cost involved in de-identification (~$30/image)
- KP: Image annotation (very time consuming) is a major need;
- JC: can we crowdsource annotation with the gamer population? A gaming pilot study
- KP: need clinically acquired images (rather than simulated)
- Need a template designed by experts to train the gamers and provide parameters
- Collect results from >10 participants to get to a "single" best
- Start pilot at OSU with eSports gamers…have panel of experts validate and judge approach. Experts vet outliers
- Improve efficiency of AI algorithm based on pattern recognition; need new biomarkers for acute stroke analysis and understand the predictive ability of certain groups of markers
- Need a core lab for AI for a toolkit
- ImageNet at Stanford
- Million Brain Cells initiative: crowdsourcing medical data has ethical issues…these need to be better understood

Potential project ideas:

1. Develop ways to predict which patients would benefit from TPA administration based on limited imaging and ER-linked data

2. Crowdsource medical image annotation as training datasets for AI applications using standard clinical images, just increasing the number of annotated images to increase efficiency

3. Develop methods to use validated optical computed tomography (OCT) real time in surgery to bypass standard pathology assessments (post-surgical). For example, intraoperative OCT imaging and analysis (using AI) to assess for example, completion of surgical margins in pancreatic cancer surgery.