

Introducing IIT Team

Background:

Healthcare Technology Innovation Centre (HTIC) is an R&D centre of IIT Madras. Our larger mission is to develop affordable technology solutions for unmet healthcare needs of India.

Motivation and goals for this eeDAP study

Our motivation stems from our interest in the computational aspects of cancer diagnosis from digital slides of pathology samples. One of our technical pursuits is to build computational models for visual pattern recognition and decision making from pathology slides – an expert cognitive skill that we hope to emulate using modern Machine Learning. Towards translating such technology to the growing cancer diagnosis demand in India (1 million new cases of cancer every year), we wish to determine the following:

- * The diagnostic parameters that can be reliably offloaded to state of art computational analysis rather than human reading – to provide time benefits, in addition to objectivity and accuracy. The eeDAP study plan recommends mitotic figure counting, which is still a computational challenge, but a clinical need. We are interested in tractable computational tasks that can still provide clinical value, and result in field deployment, while continuing to develop technology towards the challenging tasks.

- * Standardization pre- and post acquisition: variability in staining and camera characteristics and parameters result in challenges to computational analysis. We are keen to find out the settings, values and methods that will result in controlled and consistent digital slides. This is in line with the eeDAP study plan to assess the digital image quality (vis-a-vis the optical) – color fidelity, focus quality and depth of field. We are also interested in post-acquisition digital corrections towards standardizing stains and structures, that may improve performance of computational analysis.

- * Task based references for algorithm evaluation: Inter-reader variability is a problem for algorithm development, and reference ground truth based on consensus does not convincingly establish efficacy of algorithms for clinical deployment especially in scenarios where statistical risks and costs of errors are high. The eeDAP method of synchronizing FOVs to be read is therefore appealing, and we wish to explore it as a concrete method for generating expert annotations for algorithm development.

We will work with CMC Vellore for clinical inputs and slides. CMC Vellore is a large teaching and research hospital with experts in pathology and access to modern technology and latest practices. We will also tap into additional cancer centres and pathology depts in leading hospitals as and when needed. We will coordinate with a parallel eeDAP study at Cold Spring Harbor Laboratories. Core ML algorithms and UI software developed at HTIC in the context of an ongoing study of high resolution images from the Mouse Brain Architecture Project will be used in both projects to allow comparisons and explore other synergistic activities.

Plans

Our plan to run the eeDAP study in HTIC consists of the following phases: 1. Create the eeDAP setup 2. Collaborate with pathology departments of teaching and research hospitals like CMC Vellore, to source slides 3. Run a pilot study of the recommended eeDAP plan with 3-5 pathologists, and alongside prepare a questionnaire, evolve optimal parameters and devise objective metrics for qualitative aspects, and recommendations for standardization.

IIT Team

Hi, I am Jayaraj Joseph from HTIC, IIT Madras. I am interesting in setting up an eeDAP study in partnership with one / multiple of our clinical collaborators. I am interested in improving access to digital pathology in resource constrained settings and to explore the use of computational intelligence based methods to solve the lack of access to skilled personnel in delivering effective and quality care.

I am Keerthi, writing on behalf of Pf. Mohan (Mohanankar Sivaprakasam) of IIT Madras. I am also involved in Pf. Partha Mitra's Mouse Brain Architecture project. We wish to get onboard alongside Pf. Mitra's team for doing an eeDAP study. We at the Healthcare Technology Innovation Centre, IIT Madras will leverage our strong network of hospitals and diagnostic centres in India including large teaching and research hospitals like CMC Vellore, large private hospitals like Apollo, community focused cancer centres like Malabar Cancer Centre, and leading private labs, to bring in readers for the study.