Battling Blindness in Premature Babies: An Image Processing and Machine Learning Based Application for Early Detection and Prevention of Retinopathy of Prematurity

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Retinopathy of Prematurity (ROP), observed in infants born preterm with low birth weight, is a leading cause of blindness worldwide. ROP shows no external signs or symptoms. Currently, the gold standard to detect ROP is through meticulous examination by an expert ophthalmologist. However, in under-developed areas, where the ratio of patients to ophthalmologist is high, screening for ROP is difficult. Studies have shown that about 36% of neonatologists in USA have been unable to transfer a child to a NICU (Neonatal Intensive Care Unit) with reduced vision because of a lack of specialists available for ROP screening. With the ultimate goal of making early screening and treatment of ROP more effective and accurate, I have developed a computer-based automated framework that uses a combination of advanced image processing and deep machine learning to detect severity levels of ROP. The goal is to build a framework that can be used by non-physician staff to screen, prevent, and treat ROP. It will also help the ophthalmologist in better decision making. Image processing and deep learning were used to identify the optic disc, macula, zones, and various stages of ROP. It improves over traditional algorithms that use retinal fundus images with handcrafted biomarkers by providing a way to quantitatively measure the biomarkers for ROP. The biggest impact lies in the fact it is automated, cost-effective, and can complement efforts in telemedicine and traditional approaches to efficiently and accurately treat and diagnose infants who are at risk of ROP in underserved areas.

Awards Won:

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