24
Key brain region identification in obesity prediction with structural MRI and probabilistic uncertainty aware model

Walia Farzana[1], Megan A. Witherow[1], Ahmed Temtam[1], Liangsuo Ma[2], Melanie Bean[2], F. Gerry Moeller[2] and K.M. Iftekharuddin[1]
[1]Old Dominion University and [2]Virginia Commonwealth University

OBJECTIVES/GOALS: Predictive performance alone may not determine a model's clinical utility. Neurobiological changes in obesity alter brain structures, but traditional voxel-based morphometry is limited to group-level analysis. We propose a probabilistic model with uncertainty heatmaps to improve interpretability and personalized prediction. METHODS/STUDY POPULATION: The data for this study are sourced from the Human Connectome Project (HCP), with approval from the Washington University in St. Louis Institutional Review Board. We preprocessed raw T1-weighted structural MRI scans from 525 patients using an automated pipeline. The dataset is divided into training (357 cases), calibration (63 cases), and testing (105 cases). Our probabilistic model is a convolutional neural network (CNN) with dropout regularization. It generates a prediction set containing high-probability correct predictions using conformal prediction techniques, which add an uncertainty layer to the CNN. Additionally, gradient-based localization mapping is employed to identify brain regions associated with low uncertainty cases. RESULTS/ANTICIPATED RESULTS: The performance of the computational conformal model is evaluated using training and testing data with varying dropout rates from 0.1 to 0.5. The best results are achieved with a dropout rate of 0.5, yielding a fivefold cross-validated average precision of 72.19% and an F1-score of 70.66%. Additionally, the model provides probabilistic uncertainty quantification along with gradient-based localization maps that identify key brain regions, including the temporal lobe, putamen, caudate, and occipital lobe, relevant to obesity prediction. Comparisons with standard segmented brain atlases and existing literature highlight that our model's uncertainty quantification mapping offers complementary evidence linking obesity to structural brain regions. DISCUSSION/SIGNIFICANCE OF IMPACT: This research offers two significant advancements. First, it introduces a probabilistic model for predicting obesity from structural magnetic resonance imaging data, focusing on uncertainty quantification for reliable results. Second, it improves interpretability using localization maps to identify key brain regions linked to obesity.

25
The association of a documented prescription of medication for opioid use disorder (MOUD) during pregnancy with maternal outcomes

Ashley Hailer[1], Pauline Terebuh[2], Rong Xu[3], David C. Kaelber[4] and Pamela B. Davis[5]
[1]Case Western Reserve University School of Medicine, Cleveland, OH, USA; [2]Center for Artificial Intelligence in Drug Discovery, Case Western Reserve University School of Medicine, Cleveland, OH, USA; [3]Center for Artificial Intelligence in Drug Discovery, Case Western Reserve University School of Medicine, Cleveland, OH, USA; [4]Center for Clinical Informatics Research and Education, The MetroHealth System, Cleveland, OH, USA and [5]Center for Community Health Integration, Case Western Reserve University School of Medicine, Cleveland, OH, USA

OBJECTIVES/GOALS: Opioid use disorder (OUD) at delivery increased between 1999 and 2014. Clinical guidelines include medication for OUD (MOUD) for pregnant women with OUD and is associated with better fetal outcomes. Few large studies have compared prenatal MOUD outcomes to no MOUD. We evaluated the association of documented MOUD prescription during pregnancy with maternal outcomes. METHODS/STUDY POPULATION: We utilized aggregated electronic health records using the TriNetX platform to conduct a retrospective cohort study of females, aged 1249 years with a childbirth CPT code and documented opioid use via ICD-10 codes in the nine months before delivery between 2014 and 2020, comparing patients with MOUD prescription of buprenorphine or methadone during the nine months before delivery to demographically matched patients without any documented MOUD, using hazard ratios and 95% CIs for outcomes occurring one week to one or three years after childbirth. RESULTS/ANTICIPATED RESULTS: MOUD cohort (n = 6,945, 85.33% White; 82.77% Non-Hispanic or Latino) was associated with significantly higher subsequent documented MOUD prescription (HR, 9.26 [95% CI, 7.98–10.76]; 6.21 [95% CI, 5.60–6.88]) and new remission codes (HR, 2.79 [95% CI, 2.15–3.62]; 2.85 [95% CI, 2.38–3.40]) at one and three years, lower ED visits at one year (HR, 0.88 [95% CI, 0.81–0.96]), no significant association of ED visits at three years (0.95 [95% CI, 0.89–1.02]), higher outpatient visits (HR, 1.26 [95% CI, 1.20–1.32]; HR, 1.27 [95% CI, 1.21–1.33], and no significant association of inpatient visits at one and three years (HR, 0.93 [95% CI, 0.813–1.06]; 1.06 [95% CI, 0.96–1.18]) than the never-MOUD cohort (n = 4,708, 76.11% White; 75.68% non-Hispanic or Latino). DISCUSSION/SIGNIFICANCE OF IMPACT: A documented prescription for MOUD during pregnancy is associated with newly documented remission of OUD, increased outpatient visits, decreased ED visits, and additional documented MOUD prescriptions suggestive of increased access to continuity care. Efforts to increase MOUD use in pregnancy may improve maternal outcomes.

26
Evaluating AI models trained with varying amounts of expert feedback for chronic graft-versus-host disease skin assessment in photos of patients with diverse skin tones*†

Andrew McNeil[1], Kelsey Parks[1], Michael Pogharian[1], Edward W Cowen[2], Julia Lehman[3], Stephanie J Lee[4], Steven Z Pavletic[5], Benoit M Dawant[1] and Eric R Tkaczyk[1]
[1]Vanderbilt University Medical Center; [2]National Institute of Arthritis and Musculoskeletal; [3]Skin Diseases Mayo Clinic; [4]Fred Hutchinson Cancer Center and [5]Center for Cancer Research, National Cancer Institute

OBJECTIVES/GOALS: Manual skin assessment in chronic graft-versus-host disease (cGVHD) can be time consuming and inconsistent (>20% affected area) even for experts. Building on previous work we explore methods to use unmarked photos to train artificial intelligence (AI) models, aiming to improve performance by expanding and diversifying the training data without additional burden on