

The Generalizability of Subcortical Biomarkers for Early-Life Caregiving Adversity

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Introduction

- Healthy relationships with caregivers are necessary substrates of normative social and emotional development
- Previous research reports that, relative to healthy relationships, abusive or neglectful child-caregiver bonds impact neural development and behavior in several ways
 - Subcortical development
 - Neuroendocrinology
 - CBCL of behavioral and psychological pathology
- Currently no consensus exists to dictate the expected course of subcortical development following early-life caregiving adversity

Background

- Current research has focused on explanatory models.
- Such models are prone to overfitting if remedial measures (e.g., cross-validation) are not employed during and after model fitting
- Such models cannot provide information about the generalizability of their interpretations
- They do not help us understand what to expect when new individuals experience early-life caregiving adversity
- They are insufficient for predicting any one person's future course of development

The Present Study

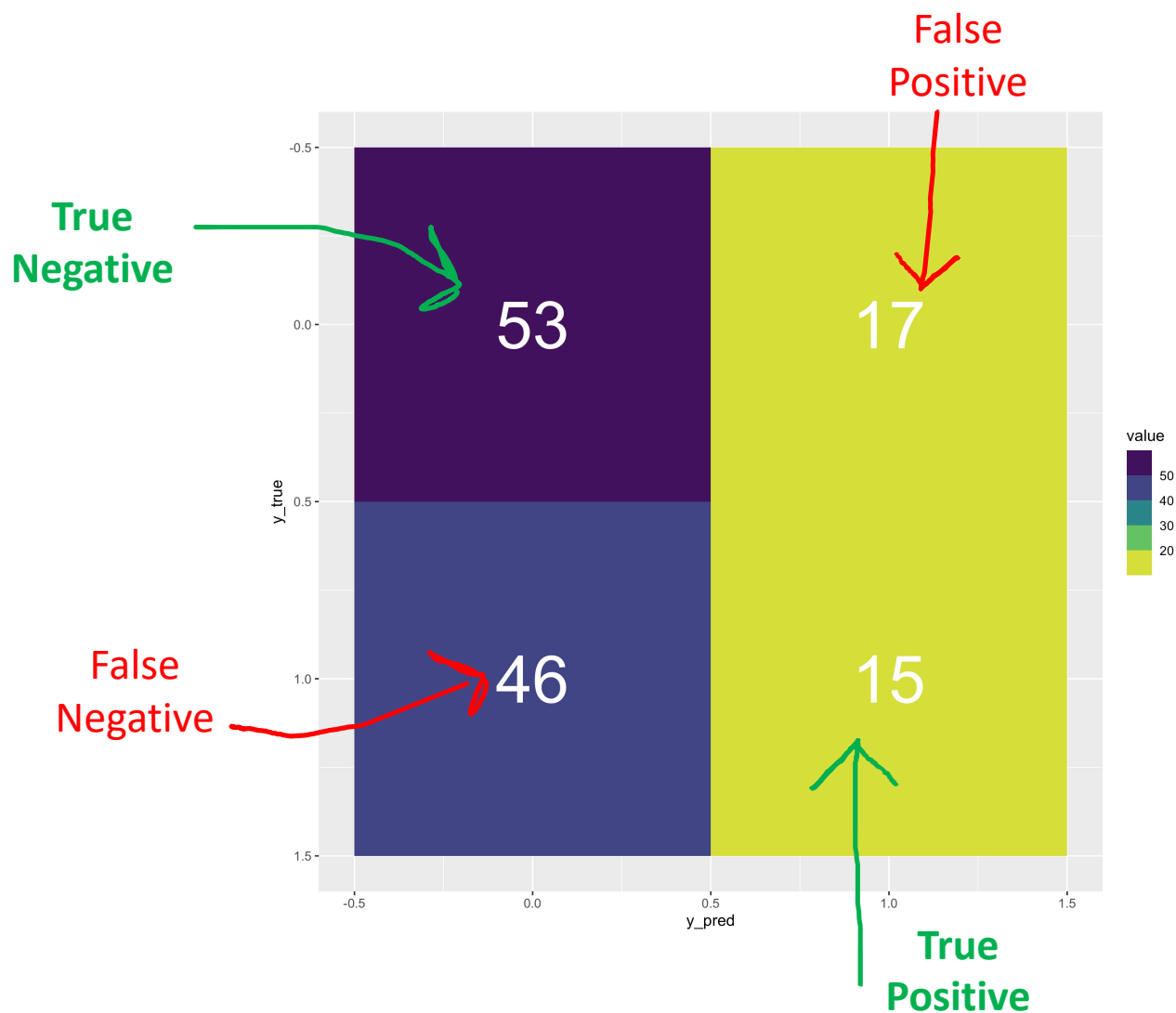
- This study focuses on subcortical development because
 1. Past research suggests its vital role in determining social and emotional development
 2. Subcortical structures such as the amygdala and hippocampus are further implicated in vital psychological and cognitive functions
 3. Past research has generated myriad subcortical correlates of early-life

Approach: build *predictive models* through *cross-validation*, modeling the **probability** that a subject was exposed to early-life caregiving adversity, using volumetric measurements of the subcortex taken later in life.

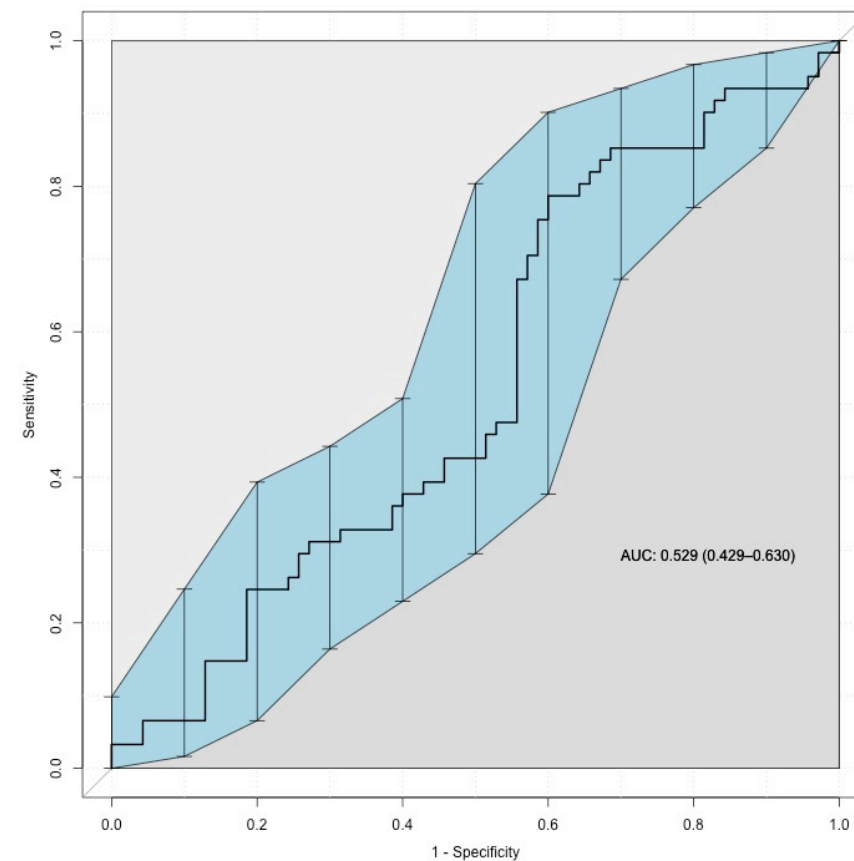
Methods: Analysis

- Predictive Models
 - Gradient Boosted Machine (GBM) Classifiers
 - FEATURES: Subcortical grey-matter volume (structural MRI)
 - RESPONSE: Previous orphanage institutionalization (yes/no)
- Preprocessing
 - Cross-validated confound regression (CVCR; Snoek et al., 2019)
- Cross-validation
 - Repeated (x100) 40/30/30 train-tune-test splits
- Statistical significance assessed using permutation testing
 - All models are replicated 1000 times after randomizing PI/COMP group labels
- Interpretation of the importance of subcortex features
 - Cross-Validated Permutation Variable Importance (CVPVI)
- ~~Likelihood ratio tests to parse out the unique contributions of subcortex features relative to confounds to model predictions (Dinga et al., in press)~~

Results: Predictive Performance

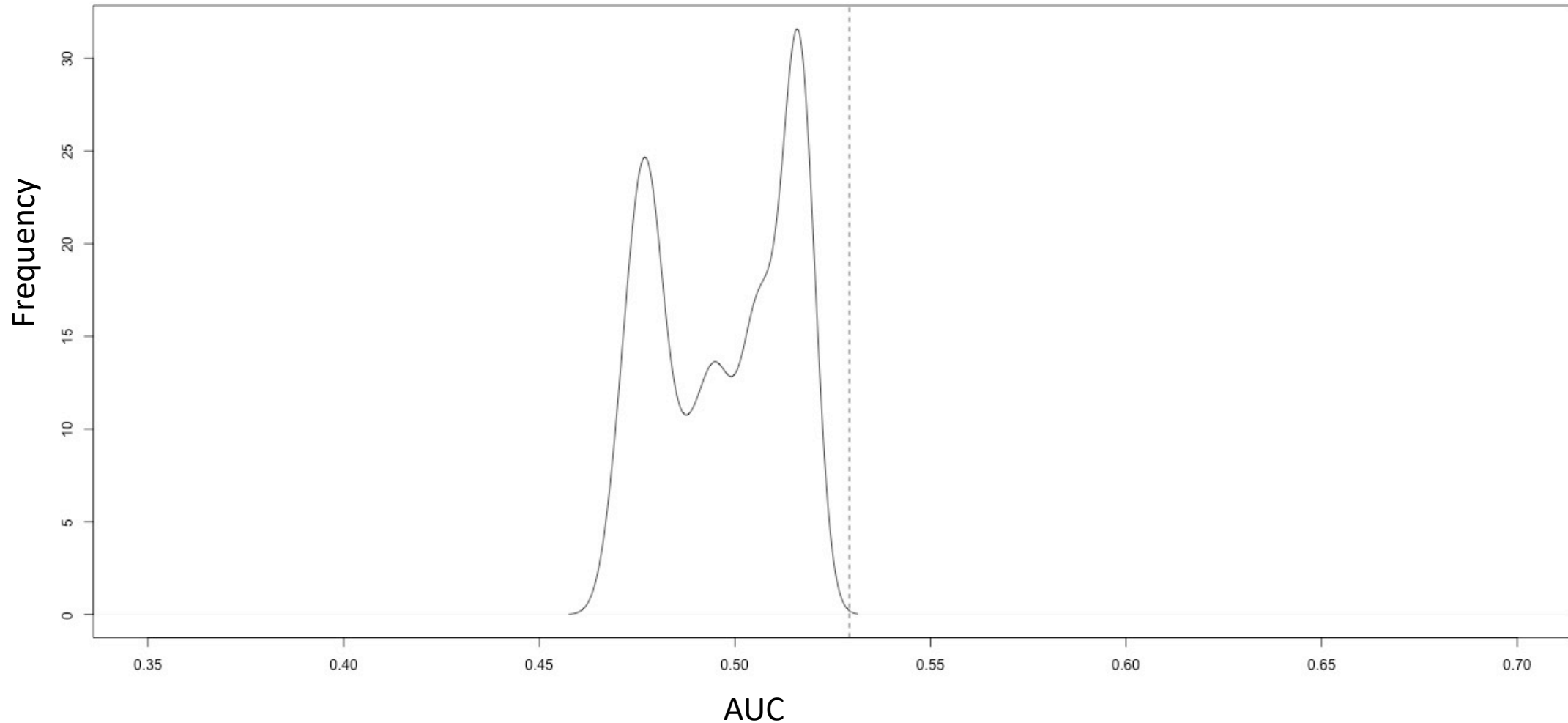


Area Under the Receiver-Operator Characteristic Curve



Results: Model Significance

The density of null AUC values (dotted line denotes the true model AUC)



Results: Interpretation

Cross-Validated Permutation Variable Importance (CVPVI) and Significance

