DISCOVERING AI APPLICATIONS FOR TRAUMATIC BRAIN INURY CARE

Brian Lerner[1], Pranav Manjunath[2], Bradley Kolls[3], Sam Berchuck[4]

Duke BASS CONNECTIONS

AI4 TBI

Dunn Lab tdunnlab.org

5M
Estimated number of Americans that seek emergency medical care for traumatic brain injury (TBI) each year.

3
Main classifications of TBI (mild, moderate, severe). Heterogeneity and complexity make it difficult to treat.

PROJECT GOAL

In the 2024-2025 academic year, the AI4TBI Bass Connections team will work to discover how AI can improve TBI care at Duke, and develop informed proposals to help make it a reality.

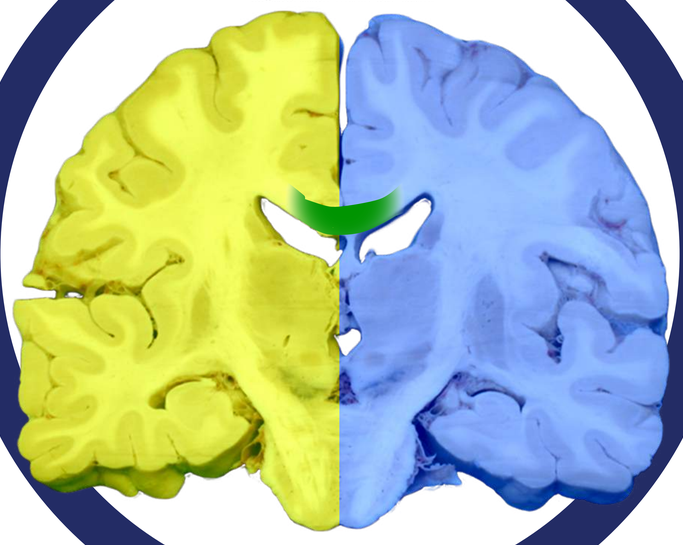
7
Faculty leaders and contributors attached to the project, hailing from diverse disciplines at Duke.

22
Undergraduate and graduate students from over 10 different majors, composing an interdisciplinary team.

TEAM ETHOS

We believe that to make a real impact on TBI, different disciplines need to work together. On our team, we harmoniously work to clean and validate EHR while interviewing and engaging stakeholders in the hospital.

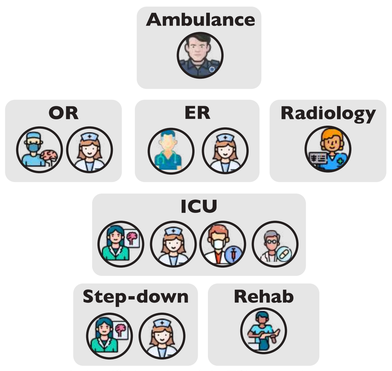
The corpus callosum connects the two halves of the brain and here represents the collaboration within our team.



CHIEF DELIVERABLE

A set of proposals for AI applications guided by both our qualitative and quantitative efforts. These will be be presented to all stakeholders, whose feedback will guide future efforts.

QUALITATIVE



A simplified version of the TBI care pathway.

CLINICAL CHAMPIONS

- The TBI care pathway is complex, spanning many departments and roles.
- Students will identify and engage key healthcare providers for TBI who will help us on our project, and are known as clinical champions.

SHADOWING

- Using their established contacts, students will go into the hospital and shadow providers, gaining first-hand experience of the care pathway.
- Quantitative students will join in the shadowing to gain context for the EHR data.

Team leaders shadowing Duke neurosurgeon, Dr. Syed Adil.

INTERVIEWS

- Each subteam will then perform a qualitative study by interviewing numerous providers for key roles in the care pathway.
- Audio collection will be followed by transcription and Rapid Analysis.

Interview Guide Sample

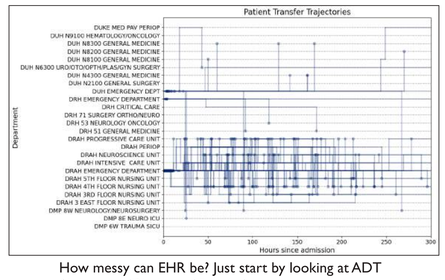
What is your typical workflow?
What are your pain points?
What are your perceptions of AI?
What concerns do you have about bias in the EHR data?
What do patients need?

QUANTITATIVE

EDA

- Our dataset spans multiple modalities, including tabular, text, and image data.
- Students will work to visualze the EHR and understand its complexity.

Some parts of our dataset. Clockwise R-L from top: demographics, CT scans, ADT, written reports, exams, laboratory results, medications.



How messy can EHR be? Just start by looking at ADT (Admission/Discharge/Transfer) data.

QUALITY ASSURANCE

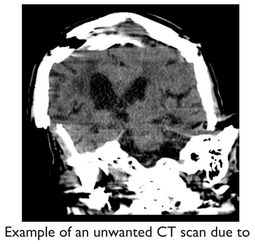
- Students will validate our data with input from champions, dealing with missingness and other EHR issues along the way.
- Some data, such as CT scans, will require special attention to filter out unwanted items.

MODEL DEVELOPMENT

- Using respected checklists, students will build the frameworks for clear, realistic, and unbiased models.

TRIPOD+AI

A 27-item checklist for proper planning and transparent reporting of predictive models for healthcare.



Example of an unwanted CT scan due to the presence of a severe motion artifact.

Author Affiliations 1-Electrical & Computer Engineering, 2-Biomedical Engineering, 3-Neurology, 4-Biostatistics & Bioinformatics. All departments within Duke University, Durham, NC.

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