

Breakout Session 8: Track B

Piloting a Web-Based Neuropathology Image Resource for the ADRC Community: The Brain Digital Slide Archive

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Piloting a web-based neuropathology image resource for the ADRC community

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Goals for Pilot

- 1) Collect sample digital slide sets from ADRC centers
- 2) Survey sample collection metadata
- 3) Customize (B)DSA to simplify neuropathology workflows
- 4) Demonstrate NP specific analysis integrated into the DSA



Neuropathology Data Collection Overview

The status of digital pathology and associated infrastructure within Alzheimer's Disease Centers.

Scalco R, Hamsafar Y, White CL, Schneider JA, Reichard RR, Prokop S, Perrin RJ, Nelson PT, Mooney S, Lieberman AP, Kukull WA, Kofler J, Keene CD, Kapasi A, Irwin DJ, Gutman DA, Flanagan ME, Crary JF, Chan KC, Murray ME, Dugger BN.

J Neuropathol Exp Neurol. 2023 Feb 21;82(3):202-211. doi: 10.1093/jnen/nlac127.

PMID: 36692179 [Free PMC article.](#)

Survey of Neuroanatomic Sampling and Staining Procedures in Alzheimer Disease Research Center Brain Banks.

Vizcarra JC, Teich AF, Dugger BN, Gutman DA; Alzheimer's Disease Research Center Digital Pathology Working Group.

Free Neuropathol. 2023 Apr 13;4:4-6. doi: 10.17879/freeneuropathology-2023-4696. eCollection 2023 Jan.

PMID: 37347036 [Free PMC article.](#)

Image Viz: What We Had

Gallery features

Show project metadata

Images thumbnail view

<< < 1 of 2 (70 of 84) > >>

Select all on the page or Select the first 100 images. You can select maximum 100 images.

2006

2007

2008

2009

2010

2011

2012

2013

2014

2015

2016

2017

2018

2019

2020 (26)

E20-106 (84) ✓

Show all

E20-11

E20-121

Found: 1 items

Biels con.svs

E20-106_1 AB.svs

E20-106_1 Biel...

E20-106_1 HE.svs

E20-106_1 pTD...

E20-106_1 Syn...

E20-106_1 Tau...

E20-106_10 AB...

E20-106_10 HE...

E20-106_10 Sy...

E20-106_10 Tau...

E20-106_11 HE...

E20-106_11 Sy...

E20-106_11 Tau...

E20-106_12 HE...

E20-106_12 Sy...

E20-106_12 Tau...

E20-106_13 HE...

E20-106_13 Sy...

E20-106_13 Tau...

E20-106_14 AB...

E20-106_14 HE...

E20-106_14 Sy...

E20-106_14 Tau...

E20-106_15 Sy...

E20-106_15 Tau...

E20-106_16 HE...

E20-106_16 Sy...

Image Viz: Metadata Driven Views

The screenshot displays the 'Image Organizer' web application interface. At the top, there are navigation and configuration options: Theme (flat), Hosts (MegaBrain), Collections (Emory-ADRC), and Admin (Admin). Below this, there are controls for 'Show project metadata' and 'NP view'. The main area features a horizontal gallery of six brain tissue images, each with a label: Hippocampus, Anterior basal ganglia, Posterior basal ganglia, Hypothalamus, Thalamus, with subth..., and Mic. The 'Hippocampus' image is currently selected and enlarged in the main view. Below the gallery is a row of buttons for different stains: Biels, aBeta, HE, pTDP, Syn, and Tau. The 'HE' button is active. At the bottom, there are controls for 'Stain' (a toggle switch) and 'Mode' (Single and Split). The main view shows a large, detailed image of the selected 'Hippocampus' tissue, stained with HE. To the right of the image is a 'Metadata' panel with the following information:

- Metadata
- _id: 641bfdee867536bb7a236c70
- ▶ Main properties
- ▼ Metadata properties (3)
 - ▼ npClinical (34)
 - ABC : 3
 - Age at Death/Bx : 73
 - Age at Onset : 69

Image Registration / Overlay

The screenshot displays a software interface for image registration and overlay. At the top, a dropdown menu is set to "NP view". Below it, a row of six image thumbnails is shown, each with a title and a checkmark: "E20-106_1 AB.svs", "E20-106_1 Biels.svs", "E20-106_1 HE.svs", "E20-106_1 pTDP.svs", "E20-106_1 Syn.svs", and "E20-106_1 Tau.svs". The "E20-106_1 pTDP.svs" thumbnail is highlighted with a blue border.

Below the thumbnails is a horizontal bar with 15 buttons representing brain regions: Hippocampus, Anterior basal ganglia, Posterior basal ganglia, Hypothalamus, Thalamus, with subthalamic nucleus, Midbrain, Pons, Medulla, Cerebellum and dentate nucleus, Upper spinal cord, Lower spinal cord, Amygdala, Frontal cortex, Temporal cortex, Parietal cortex, Occipital cortex, and Left peri-Rolandic cortex.

The main workspace is split into two panels. The top panel shows a histological image with a region of interest highlighted in blue. The bottom panel shows the same image with a different region highlighted in blue. To the left of the main workspace are two sets of sliders for "Colorize", "Hue", "Brightness", "Contrast", and "Rotation", each with a value of 0.00. Below the sliders are two color palettes. To the right of the main workspace is a metadata panel with two sections. The top section is for a region with ID "5fb731df61c06b4b4" and the bottom section is for a region with ID "5fb731e561c06b4b4". Both sections show "Main properties" and "Metadata properties (1)". The metadata properties include "npSchema (4)", "blockID : 1", "caseID : E20-106", "regionName : Hip", and "stainID : aBeta" for the top section, and "blockID : 1", "caseID : E20-106", "regionName : Hip", and "stainID : pTDP" for the bottom section.

Packaging Algorithms for Distribution

The screenshot displays the HistomicsUI web application interface. The main window shows a histology image with numerous red and blue dots representing annotations. The interface includes a top navigation bar with the HistomicsUI logo, project information (NFT-AI-Project / Inference-Cohort-1 / A03-74 / OS03-163_1A_TAU.svs), and various tool buttons like 'Annotated images...', 'Open image...', and 'Analyses'. A right sidebar contains a 'Metadata' section and an 'Annotations' section with a visibility slider and a list of annotation layers. The list includes 'Background', 'Other', 'Pre-NFT', 'ROIv1', 'ROIv2', 'ROIv3', 'background-roi', and 'iNFT'. Under 'iNFT', there are several 'hil-labels-n' entries (n1 through n6) with icons for visibility, settings, and download. At the bottom of the image, three overlapping boxes highlight specific Docker repository paths: 'hp_tau_detection', 'cli-tasks', and 'dsarchive/histomicstk'. A fourth box, 'jvizcar/braak-study', is partially visible on the right side.

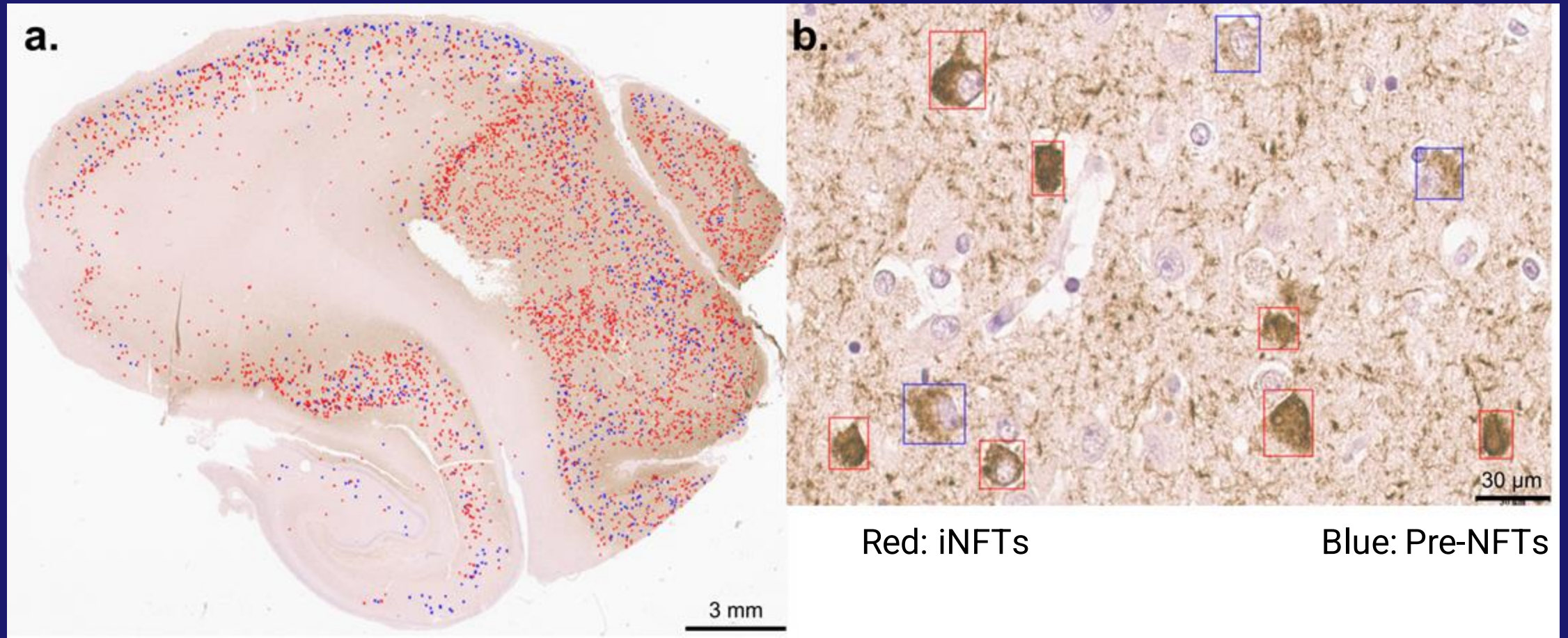
hp_tau_detection

cli-tasks

dsarchive/histomicstk

jvizcar/braak-study

Example NP Analysis: NFT Detection



WSI Inference workflow - use best YOLO model to predict on entire tissue



Toward a generalizable machine learning workflow for neurodegenerative disease staging with focus on neurofibrillary tangles.

Vizcarra JC, Pearce TM, Dugger BN, Keiser MJ, Gearing M, Crary JF, Kiely EJ, Morris M, White B, Glass JD, Farrell K, Gutman DA.

Acta Neuropathol Commun. 2023 Dec 18;11(1):202. doi: 10.1186/s40478-023-01691-x.

PMID: 38110981 **Free PMC article.**





Challenges

- 1) Metadata harmonization is tedious
- 2) Generalization / validation of algorithms across sites
- 3) Data Storage and Compute Resources



Future Work

1. Received U24 to develop federated version of BDSA
2. Algorithm and UI enhancements for Human-In-The-Loop AI workflows
3. Improved / More Flexible Job Execution Pipelines