

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

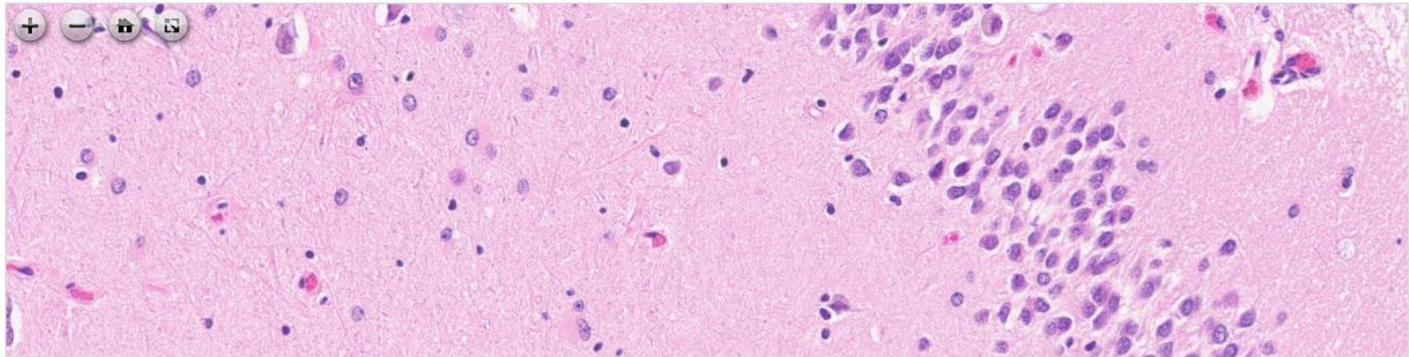
Image Organizer Theme: flat Hosts: MegaBrain Collections: Emory-ADRC Admin Admin

Show project metadata NP view

Hippocampus Anterior basal ganglia Posterior basal ganglia Hypothalamus Thalamus, with subth... Mid

Biels aBeta HE pTDP Syn Tau

Stain Mode: Single Split



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 image thumbnails is shown, with "E20-106_1 AB.svs" and "E20-106_1 pTDP.svs" selected. A central panel shows a split view of two histological images. To the left of this panel are two sets of sliders for "Colorize", "Hue", "Brightness", "Contrast", and "Rotation", each with a color palette below. Below the sliders are radio buttons for "Region" and "Mode" (Single, Split, Combine), and checkboxes for "Sync" and "Points" (Add, Remove, Off). On the right, a sidebar displays metadata for two regions, including "npSchema (4)", "blockID : 1", "caseID : E20-106", "regionName : Hipp", and "stainID : aBeta".

NP view

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 E20-106_1 Tau.svs

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 Left peri-Rolandic cortex

Region Mode: Single Split Combine Sync Points: Add Remove Off

Colorize: 0 Hue: 0.00 Brightness: 0.00 Contrast: 0.00 Rotation: 0.00

Colorize: 0 Hue: 0.00 Brightness: 0.00 Contrast: 0.00 Rotation: 0.00

npSchema (4)
blockID : 1
caseID : E20-106
regionName : Hipp
stainID : aBeta

npSchema (4)
blockID : 1
caseID : E20-106
regionName : Hipp
stainID : pTDP

Packaging Algorithms for Distribution

HistomicsUI NFT-AI-Project / Inference-Cohort-1 / A03-74 / OS03-163_1A_TAU.svs Annotated images... Open image... Analyses admin Help

Fit 2.5 5 10 20 40 80
Download View Download Area

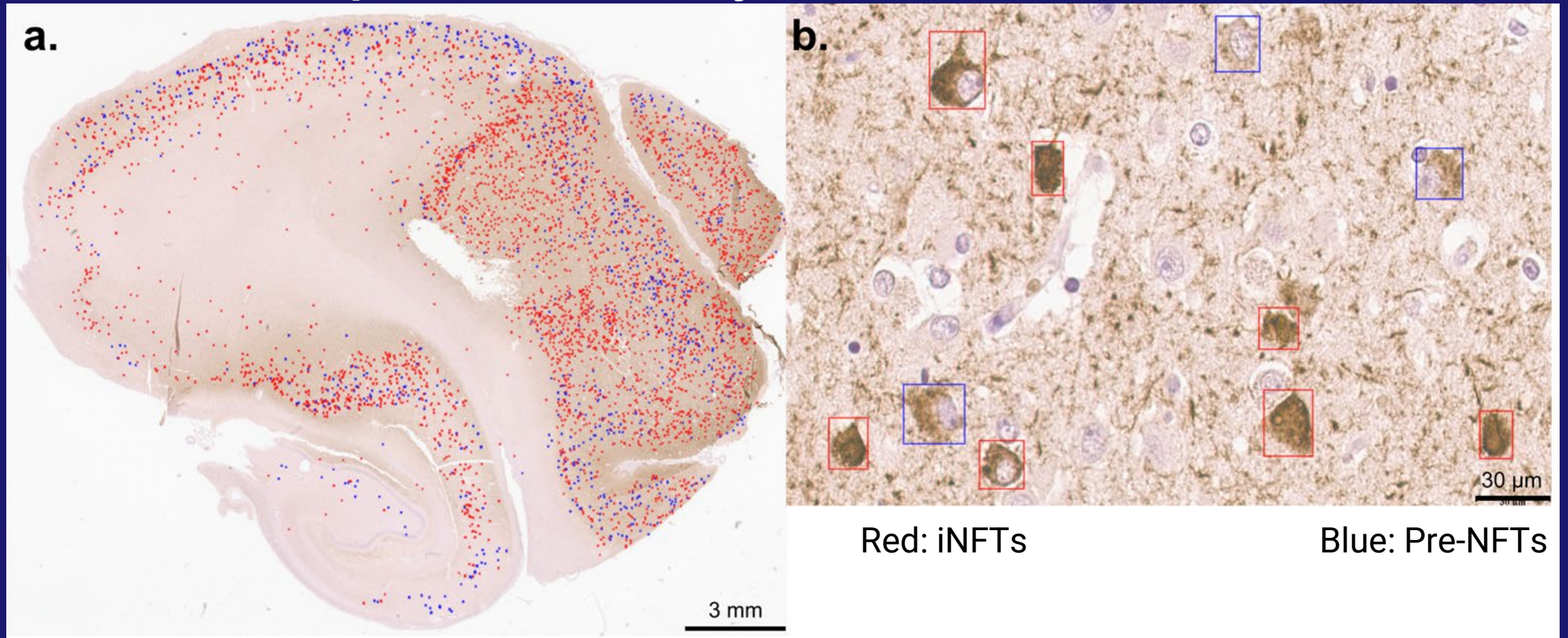
Metadata ABC 3

Annotations

- Background
- Other
- Pre-NFT
- ROIv1
- ROIv2
- ROIv3
- background-roi
- iNFT
 - hil-labels-n3
 - hil-labels-n4
 - hil-labels-n5
 - hil-labels-n2
 - hil-labels-n6
 - hil-labels-n1

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