

SUPPLEMENTARY INFORMATION

Deep learning-based model for diagnosing Alzheimer's disease and tauopathies

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Table S1: Diagnosis results of hold-out dataset

Case ID	Disease	Age	Sex	Braak	Thal	Clinical diagnosis	Dx in CP13	Dx in AT8
HO-1	AD	65	F	VI	5	CBS	AD	AD
HO-2	AD	69	M	VI	5	CBS	AD	AD
HO-3	AD	70	F	VI	5	CBS	AD	AD
HO-4	AD	72	F	VI	5	CBS	AD	AD
HO-5	AD	74	F	VI	5	AD	AD	AD
HO-6	AD	76	F	VI	5	AD	AD	AD
HO-7	AD	78	M	V	5	AD	AD	AD
HO-8	AD	82	M	VI	5	CBS	AD	AD
HO-9	AD	82	M	VI	5	AD	AD	AD
HO-10	AD	83	F	VI	5	AD	AD	AD
HO-11	CBD	61	F	II	0	PSP	CBD	CBD
HO-12	CBD	66	M	II	3	PSP	CBD	CBD
HO-13	CBD	66	M	0	0	PSP v PDD	CBD	CBD
HO-14	CBD	67	M	I	0	PSP	CBD	PiD
HO-15	CBD	68	F	IV	5	CBS/AOS	CBD	CBD
HO-16	CBD	69	M	IV	0	AD v PiD	CBD	CBD
HO-17	CBD	69	F	III	3	MSA	CBD	CBD
HO-18	CBD	71	F	IV	3	PSP v CBS	CBD	CBD
HO-19	CBD	72	F	II	1	PSP	PiD	CBD
HO-20	CBD	74	F	II	2	FTD	CBD	CBD
HO-21	CBD	75	M	IV	3	CBS	PiD	CBD
HO-22	CBD	77	M	III	1	MSA	CBD	CBD
HO-23	CBD	82	M	IV	5	CBS	CBD	CBD
HO-24	PiD	53	F	0	0	bvFTD	PiD	PiD
HO-25	PiD	62	M	II	0	AD	PiD	PiD
HO-26	PiD	62	F	0	0	bvFTD	PiD	PiD
HO-27	PiD	63	M	IV	0	FTD/PPA v NPH	PiD	CBD
HO-28	PiD	65	M	II	0	FTD	PiD	PiD
HO-29	PiD	66	M	0	0	Atypical AD	PiD	PiD
HO-30	PiD	69	M	VI	5	Early-onset AD	PiD	PiD
HO-31	PiD	70	M	I	0	FTD	PiD	PiD
HO-32	PiD	74	F	IV	4	AD	PiD	PiD
HO-33	PiD	74	F	II	0	FTD	PiD	PiD
HO-34	PSP	64	M	III	3	PSP	PSP	PSP
HO-35	PSP	66	M	II	0	PSP-P	PSP	PSP
HO-36	PSP	67	M	IV	4	FTD v PPA	PSP	PSP
HO-37	PSP	68	F	II	0	PSP	PSP	PSP
HO-38	PSP	70	F	III	2	CBS	PSP	PSP
HO-39	PSP	72	M	V	5	PSP	PSP	PSP
HO-40	PSP	73	M	II	0	PSP	PSP	PSP
HO-41	PSP	74	F	VI	4	DLB	PSP	PSP
HO-42	PSP	75	F	II	0	PSP-PNFA	AD	AD
HO-43	PSP	76	M	II	0	PSP/PPA	PSP	PSP
HO-44	PSP	76	M	II	0	PSP	PSP	PSP
HO-45	PSP	77	M	I	0	PSP	PSP	PSP
HO-46	PSP	77	F	V	5	MSA	PSP	PSP
HO-47	PSP	79	F	IV	4	CBS	PSP	PSP
HO-48	PSP	82	M	II	0	MSA v PD	PSP	PSP
HO-49	PSP	83	F	V	5	PSP	PSP	PSP
HO-50	PSP	84	F	VI	4	PSP	AD	AD

Abbreviations: AD, Alzheimer's disease; AOS, apraxia of speech; Braak, Braak neurofibrillary tangle stage; DLB, dementia with Lewy bodies; bvFTD, behavioral variant frontotemporal dementia; CBD, corticobasal degeneration; CBS, corticobasal syndrome; FTD, frontotemporal dementia; MSA, multiple system atrophy; NPH, normal pressure hydrocephalus; PiD, Pick's disease; PPA, primary progressive aphasia; PSP, progressive supranuclear palsy; PSP-P, PSP-parkinsonism; PSP-PNFA, PSP-progressive non-fluent aphasia; Thal, Thal amyloid phase.

Table S2: Demographic and pathologic data in 30 cases used in object detection model

Case ID	Disease	Age	Sex	Braak stage	Thal phase	Clinical Diagnosis
OD-1	AD	56	F	VI	5	AD
OD-2	AD	62	F	VI	5	AD
OD-3	AD	66	F	VI	5	AD
OD-4	AD	68	M	VI	4	AD
OD-5	AD	69	F	VI	5	AD
OD-6	AD	69	M	VI	5	AD
OD-7	AD	73	M	VI	5	AD
OD-8	AD	73	M	V	5	AD
OD-9	AD	75	F	VI	5	AD
OD-10	AD	82	F	VI	5	AD
OD-11	CBD	60	F	II	0	CBS/AOS
OD-12	CBD	61	M	II	0	CBS
OD-13	CBD	67	M	II	0	PPA
OD-14	CBD	69	M	0	0	CBS
OD-15	CBD	69	M	III	0	FTD
OD-16	CBD	70	F	II	0	PSP
OD-17	CBD	70	M	III	0	CBS
OD-18	CBD	70	M	I	0	logopenic PPA
OD-19	CBD	72	M	III	0	CBS
OD-20	CBD	77	M	III	0	PSP-PAGF
OD-21	PSP	69	F	III	3	PSP
OD-22	PSP	74	F	II	0	PSP-P
OD-23	PSP	75	F	IV	4	CBS
OD-24	PSP	78	M	0	0	CBS/AOS
OD-25	PSP	79	F	II	0	PSP
OD-26	PSP	80	M	II	0	PSP
OD-27	PSP	81	M	0	0	PSP-P
OD-28	PSP	82	M	III	0	FTD
OD-29	PSP	84	M	IV	1	PSP
OD-30	PSP	84	F	0	0	PSP v MSA

Abbreviations: AD, Alzheimer's disease; AOS, apraxia of speech; CBS, corticobasal syndrome; CBD, corticobasal degeneration; FTD, frontotemporal dementia; MSA, multiple system atrophy; PPA, primary progressive aphasia; PSP, progressive supranuclear palsy; PSP-P, progressive supranuclear palsy-parkinsonism; PSP-PAGF, progressive supranuclear palsy- pure akinesia with gait freezing.

Table S3: Demographic and pathologic data in 120 cases used in decision tree and random forest classifiers

Case ID	Dx	Age	Sex	Braak stage	Thal phase	Clinical diagnosis
RF-1	AD	88	F	VI	4	CBS
RF-2	AD	86	F	VI	5	CBS
RF-3	AD	85	F	VI	5	AD
RF-4	AD	83	M	VI	5	CBS
RF-5	AD	82	F	VI	5	CBS v FTD
RF-6	AD	79	F	VI	5	AD
RF-7	AD	79	F	V	5	CBS
RF-8	AD	78	F	VI	5	AD
RF-9	AD	78	F	VI	5	AD/PD v CBS
RF-10	AD	77	M	V	5	CBS vs AD & ET
RF-11	AD	77	F	VI	5	CBS
RF-12	AD	77	F	VI	3	CBS v PSP
RF-13	AD	77	M	VI	5	CBS v PSP-P v AD visual variant
RF-14	AD	76	F	VI	5	CBS
RF-15	AD	75	M	VI	5	CBS
RF-16	AD	75	F	VI	5	CBS
RF-17	AD	74	M	VI	5	CBS
RF-18	AD	74	M	VI	5	CBS
RF-19	AD	70	F	VI	5	AD
RF-20	AD	68	F	VI	5	CBS v PCA (AD)
RF-21	AD	67	F	VI	5	FTD v CBS
RF-22	AD	67	M	VI	5	CBS (PNFA)
RF-23	AD	67	M	V	5	CBS
RF-24	AD	67	M	VI	5	CBS
RF-25	AD	64	F	VI	5	CBS
RF-26	AD	64	M	VI	5	CBS
RF-27	AD	63	F	VI	5	CBS
RF-28	AD	63	F	VI	5	CBS
RF-29	AD	63	F	VI	5	CBS
RF-30	AD	61	M	VI	5	AD
RF-31	AD	61	M	VI	5	CBS
RF-32	AD	58	F	VI	5	PCA v CBS
RF-33	CBD	84	F	III	0	Logopenic PPA
RF-34	CBD	80	F	II	2	CBS
RF-35	CBD	79	F	I	0	CBS
RF-36	CBD	78	F	II	1	CBS
RF-37	CBD	78	F	IV	4	CBS v PSP
RF-38	CBD	77	M	II	3	atypical PD v NPH
RF-39	CBD	76	F	III	1	CBS
RF-40	CBD	75	F	III	0	PSP
RF-41	CBD	75	M	III	0	CBS
RF-42	CBD	75	M	II	0	CBS
RF-43	CBD	74	F	III	3	CBS v atypical PSP
RF-44	CBD	74	F	VI	4	PSP
RF-45	CBD	73	M	III	0	CBS
RF-46	CBD	73	M	III	0	FTDP
RF-47	CBD	72	F	I	0	CBS
RF-48	CBD	72	F	II	0	CBS
RF-49	CBD	72	F	III	0	CBS
RF-50	CBD	71	F	III	3	CBS
RF-51	CBD	71	F	III	1	PSP v MSA
RF-52	CBD	71	F	II	0	FTD/PD
RF-53	CBD	70	F	II	1	FTD
RF-54	CBD	70	F	II	2	PPA
RF-55	CBD	69	F	II	0	CBS
RF-56	CBD	69	F	I	0	PSP

RF-57	CBD	66	M	I	0	CBS
RF-58	CBD	66	M	V	5	CBS
RF-59	CBD	65	M	II	0	CBS
RF-60	CBD	62	M	II	2	CBS
RF-61	CBD	61	F	I	0	FTD/PPA
RF-62	CBD	58	M	IV	0	PPA (AOS)
RF-63	CBD	58	M	IV	0	FTD v AD
RF-64	PiD	84	M	II	0	PNFA
RF-65	PiD	75	F	III	0	CBS
RF-66	PiD	74	M	0	0	FTD (SD)
RF-67	PiD	73	F	II	0	CBS
RF-68	PiD	72	F	II	1	PD v CBS
RF-69	PiD	72	M	0	0	PiD
RF-70	PiD	70	M	I	1	AD v PiD
RF-71	PiD	69	F	0	0	FTD v PNFA
RF-72	PiD	68	F	I	0	FTD
RF-73	PiD	68	F	0	1	PPA
RF-74	PiD	67	M	II	1	FTD
RF-75	PiD	67	M	III	3	PPA (logopenic) v AD
RF-76	PiD	66	M	II	2	CBS
RF-77	PiD	66	F	II	3	FTD v DLB
RF-78	PiD	65	M	II	0	FTD
RF-79	PiD	63	M	IV	1	AD/PD
RF-80	PiD	63	F	II	0	AOS
RF-81	PiD	61	F	I	0	FTD
RF-82	PiD	60	F	0	2	CBS
RF-83	PiD	59	M	II	2	CBS
RF-84	PiD	59	F	II	0	FTD
RF-85	PSP	91	M	II	3	PSP
RF-86	PSP	89	M	III	3	CBS
RF-87	PSP	87	F	IV	4	PSP
RF-88	PSP	82	F	IV	3	PSP v CBS
RF-89	PSP	82	M	V	4	CBS
RF-90	PSP	81	M	IV	3	PDD
RF-91	PSP	81	M	VI	5	PSP
RF-92	PSP	81	F	V	4	PSP
RF-93	PSP	80	M	V	5	PSP
RF-94	PSP	79	F	II	2	PSP
RF-95	PSP	79	M	II	3	PSP
RF-96	PSP	78	F	IV	5	PSP
RF-97	PSP	78	F	VI	4	CBS
RF-98	PSP	76	F	VI	5	CBS
RF-99	PSP	72	F	II	0	PSP v CBS
RF-100	PSP	72	M	I	1	PSP
RF-101	PSP	71	M	II	0	PSP
RF-102	PSP	71	M	II	0	PSP
RF-103	PSP	71	M	II	1	PSP
RF-104	PSP	71	M	III	5	MSA v PSP
RF-105	PSP	71	M	I	0	PSP
RF-106	PSP	70	M	I	0	PSP
RF-107	PSP	70	F	III	0	PSP v CBS
RF-108	PSP	69	M	II	0	PSP
RF-109	PSP	68	F	II	1	PSP
RF-110	PSP	68	F	II	0	PSP
RF-111	PSP	67	M	II	1	PSP
RF-112	PSP	67	M	II	0	PSP
RF-113	PSP	66	M	II	0	PSP
RF-114	PSP	66	F	II	2	PSP
RF-115	PSP	65	F	III	0	PSP

RF-116	PSP	65	F	II	0	PSP
RF-117	PSP	64	M	I	0	PSP
RF-118	PSP	64	F	0	0	PSP
RF-119	PSP	61	F	I	0	PSP-P
RF-120	PSP	56	M	0	0	PSP-P

Abbreviations: AD, Alzheimer's disease; AOS, apraxia of speech; CBS, corticobasal syndrome; CBD, corticobasal degeneration; FTD, frontotemporal dementia; MSA, multiple system atrophy; NPH, normal pressure hydrocephalus; PD, Parkinson disease; PDD, Parkinson disease dementia; PiD, Pick's disease; PNFA, progressive non-fluent aphasia; PPA, primary progressive aphasia; PSP, progressive supranuclear palsy; PSP-P, progressive supranuclear palsy-parkinsonism; PSP-PAGF, progressive supranuclear palsy- pure akinesia with gait freezing.

Table S4: Quantitative tau lesion burdens in 120 cases for random forest classifier

Case ID	Dx	Motor cortex					Caudate nucleus					Superior frontal gyrus				
		TA	AP	CB	NI	NP	TA	AP	CB	NI	NP	TA	AP	CB	NI	NP
RF-1	AD	0	0	1	98	9	0	0	2	100	0	0	0	1	92	6
RF-2	AD	0	0	0	33	55	0	0	0	31	2	0	0	0	106	4
RF-3	AD	0	1	1	22	17	2	2	0	16	0	0	0	0	145	4
RF-4	AD	0	0	2	48	24	0	0	0	1	0	0	0	3	26	3
RF-5	AD	3	0	3	104	17	0	5	0	48	0	0	0	0	69	26
RF-6	AD	0	0	2	48	26	0	0	0	7	0	0	0	0	164	12
RF-7	AD	0	1	1	34	15	0	0	0	5	0	0	0	0	95	3
RF-8	AD	0	0	0	70	13	0	0	1	24	0	0	0	1	142	10
RF-9	AD	0	0	0	77	13	0	0	0	5	0	0	1	0	185	27
RF-10	AD	1	1	2	57	43	0	0	0	21	2	0	2	0	40	31
RF-11	AD	0	1	1	53	20	0	0	0	0	0	0	1	0	14	1
RF-12	AD	1	0	12	25	8	0	0	0	13	0	0	3	2	59	5
RF-13	AD	0	0	0	76	30	0	0	0	2	0	0	1	2	75	1
RF-14	AD	0	2	2	106	6	0	0	0	6	0	0	0	0	116	7
RF-15	AD	0	0	0	71	22	1	0	0	7	0	0	1	2	57	9
RF-16	AD	0	0	0	15	26	0	0	0	2	0	0	1	0	69	10
RF-17	AD	0	0	2	73	18	3	0	0	4	0	0	0	0	93	6
RF-18	AD	0	0	0	42	18	0	0	0	1	1	0	0	0	52	1
RF-19	AD	1	0	0	33	61	0	0	0	10	3	0	0	1	67	42
RF-20	AD	0	0	1	91	21	0	1	1	17	1	0	0	0	102	4
RF-21	AD	0	0	0	55	63	0	0	1	12	0	0	1	0	120	5
RF-22	AD	0	0	0	67	38	0	0	0	2	0	0	0	0	140	14
RF-23	AD	1	0	2	119	20	0	0	0	0	0	0	0	2	29	6
RF-24	AD	0	0	1	51	6	0	0	1	9	1	0	0	1	101	5
RF-25	AD	0	0	0	34	13	0	0	1	13	0	0	0	0	23	4
RF-26	AD	0	1	0	11	22	0	0	0	1	0	0	1	1	29	6
RF-27	AD	0	1	2	81	18	6	0	0	3	0	0	0	0	92	12
RF-28	AD	0	1	0	60	2	0	2	0	1	0	0	0	0	126	7
RF-29	AD	0	0	1	59	6	0	0	2	4	1	0	0	0	108	10
RF-30	AD	0	0	0	88	16	0	0	0	3	0	0	0	1	107	6
RF-31	AD	0	0	1	54	34	0	0	2	2	1	0	6	0	64	21
RF-32	AD	0	0	1	77	14	0	0	0	3	0	1	0	0	81	4
RF-33	CBD	0	1	1	72	0	0	9	1	69	0	0	0	0	0	0
RF-34	CBD	0	4	2	132	3	0	0	0	75	0	0	1	2	63	0
RF-35	CBD	0	0	2	36	0	0	36	0	95	2	0	12	0	144	1
RF-36	CBD	2	5	4	90	0	0	13	1	139	0	0	4	2	156	1
RF-37	CBD	0	4	7	103	6	1	14	7	117	1	6	0	3	62	1
RF-38	CBD	0	0	2	3	0	7	72	2	41	0	10	13	4	18	2
RF-39	CBD	0	0	3	97	0	0	5	0	108	0	0	3	3	112	0
RF-40	CBD	0	1	2	145	2	2	27	2	154	0	0	5	5	170	0
RF-41	CBD	0	59	4	166	6	0	25	4	217	9	0	80	3	197	3
RF-42	CBD	0	0	6	110	0	1	145	4	57	4	0	25	5	55	0
RF-43	CBD	0	0	3	68	0	0	3	0	150	0	0	15	2	103	5

RF-44	CBD	0	2	0	20	22	0	64	1	45	7	0	6	0	75	9
RF-45	CBD	0	0	2	164	1	0	27	0	82	0	0	4	1	117	0
RF-46	CBD	0	6	11	68	0	0	3	1	163	2	0	2	0	146	5
RF-47	CBD	0	32	4	88	1	0	20	1	107	0	0	7	2	159	0
RF-48	CBD	0	1	4	166	0	0	29	4	134	2	0	18	2	109	2
RF-49	CBD	0	1	0	186	8	0	18	0	128	0	0	3	4	157	1
RF-50	CBD	0	3	3	75	0	0	2	5	71	0	4	13	4	77	0
RF-51	CBD	0	2	1	85	0	0	2	0	238	0	2	14	2	89	1
RF-52	CBD	0	1	2	174	2	0	8	2	85	4	0	3	1	161	1
RF-53	CBD	0	8	0	47	1	0	0	0	79	1	0	6	4	210	12
RF-54	CBD	1	0	4	21	0	0	2	0	159	4	0	5	1	117	0
RF-55	CBD	0	4	3	77	3	1	1	1	31	0	1	6	1	113	3
RF-56	CBD	0	0	1	109	0	0	16	2	129	0	0	28	3	139	0
RF-57	CBD	0	1	7	91	0	3	10	3	116	0	1	12	1	156	0
RF-58	CBD	2	0	3	105	2	0	40	0	143	1	0	63	0	171	15
RF-59	CBD	0	0	4	95	0	0	6	0	154	4	0	10	6	222	5
RF-60	CBD	0	2	2	140	1	0	18	1	197	2	0	19	1	165	12
RF-61	CBD	0	12	3	178	2	0	1	0	30	11	0	12	3	188	1
RF-62	CBD	0	5	0	146	2	0	58	0	108	8	0	22	3	229	6
RF-63	CBD	0	0	5	78	0	0	1	5	182	0	0	3	5	185	2
RF-64	PiD	0	1	3	137	2	0	0	1	625	0	0	0	11	219	2
RF-65	PiD	0	0	6	153	2	0	0	3	281	0	0	0	2	290	1
RF-66	PiD	0	0	0	12	0	0	0	1	334	0	0	1	1	265	0
RF-67	PiD	0	0	0	183	0	0	0	0	198	0	0	0	0	320	0
RF-68	PiD	1	4	2	125	2	0	0	1	270	0	0	3	10	183	2
RF-69	PiD	0	0	1	121	0	0	0	4	320	0	2	2	6	67	1
RF-70	PiD	0	0	0	7	0	0	0	3	471	1	0	0	33	98	0
RF-71	PiD	0	0	2	77	0	0	0	1	457	0	0	0	4	299	0
RF-72	PiD	0	0	0	1	0	0	0	0	305	0	4	0	12	167	1
RF-73	PiD	0	0	0	1	0	0	0	1	79	0	0	0	0	56	1
RF-74	PiD	0	0	0	16	0	0	0	2	689	1	0	0	7	107	2
RF-75	PiD	0	0	0	20	0	0	1	1	269	0	0	0	1	293	3
RF-76	PiD	2	5	1	145	17	0	1	2	202	1	0	0	0	227	0
RF-77	PiD	0	0	0	4	0	0	0	1	437	1	0	1	5	233	1
RF-78	PiD	0	0	0	2	0	0	0	0	720	1	0	0	0	237	2
RF-79	PiD	0	0	2	148	6	0	0	2	239	0	0	0	0	218	5
RF-80	PiD	0	0	2	150	1	0	0	0	182	0	0	0	1	358	2
RF-81	PiD	0	1	1	3	0	0	0	0	670	0	0	0	1	223	0
RF-82	PiD	8	4	1	145	0	0	0	0	177	0	0	0	2	305	0
RF-83	PiD	0	0	1	71	0	1	0	0	306	1	0	1	0	170	3
RF-84	PiD	1	1	1	4	0	0	1	2	365	1	0	0	1	208	0
RF-85	PSP	69	7	15	49	3	59	2	7	10	0	56	0	12	15	0
RF-86	PSP	74	2	31	29	0	201	8	6	17	2	60	4	2	5	0
RF-87	PSP	3	0	13	16	3	29	5	4	15	2	0	0	3	1	0
RF-88	PSP	166	7	17	36	9	42	0	3	9	0	94	0	14	44	0

RF-89	PSP	19	0	18	31	16	31	0	6	34	0	3	7	2	60	7
RF-90	PSP	13	2	7	7	0	30	1	2	1	0	138	12	18	27	1
RF-91	PSP	5	4	0	9	13	15	5	3	21	4	0	0	1	108	22
RF-92	PSP	14	1	35	48	2	13	1	2	37	2	0	0	1	146	13
RF-93	PSP	17	1	70	24	0	40	0	13	20	0	10	1	16	18	1
RF-94	PSP	1	1	55	27	0	52	2	9	13	0	37	1	14	3	0
RF-95	PSP	4	0	3	2	0	20	1	7	6	0	4	0	3	5	0
RF-96	PSP	9	0	11	21	0	97	1	4	26	1	56	1	6	16	0
RF-97	PSP	12	0	24	91	23	12	0	7	24	0	0	2	3	93	16
RF-98	PSP	55	0	59	75	9	40	22	4	45	17	15	12	3	68	49
RF-99	PSP	36	0	39	63	1	112	9	0	35	0	21	0	5	14	0
RF-100	PSP	2	0	52	43	0	28	1	7	11	1	11	0	26	14	0
RF-101	PSP	19	0	51	13	0	66	1	8	16	0	6	0	16	9	0
RF-102	PSP	5	0	37	21	0	5	0	12	12	0	1	0	18	10	0
RF-103	PSP	6	2	50	34	0	61	4	8	17	0	0	0	1	3	0
RF-104	PSP	12	0	34	15	0	22	0	9	10	0	17	2	8	7	0
RF-105	PSP	52	0	42	33	0	114	0	6	6	0	27	0	20	5	0
RF-106	PSP	24	0	34	20	0	47	1	4	9	0	26	3	19	23	1
RF-107	PSP	33	0	103	61	1	99	0	18	20	1	71	1	63	57	1
RF-108	PSP	103	0	68	29	5	40	1	14	16	1	55	1	29	15	0
RF-109	PSP	3	0	14	21	0	11	0	2	25	0	11	2	3	10	0
RF-110	PSP	17	0	42	16	0	24	1	6	7	0	7	0	11	15	0
RF-111	PSP	28	0	46	26	0	65	3	3	22	0	22	0	13	21	0
RF-112	PSP	11	0	89	39	0	36	0	8	28	0	18	0	35	24	0
RF-113	PSP	4	0	24	30	0	77	1	12	10	0	28	2	32	17	0
RF-114	PSP	11	0	32	22	0	32	0	5	13	1	20	0	12	16	1
RF-115	PSP	9	0	28	16	0	116	1	6	8	0	15	1	15	7	0
RF-116	PSP	4	0	107	64	0	6	0	16	3	0	6	1	16	18	0
RF-117	PSP	10	0	50	42	0	109	1	11	9	0	17	1	12	13	0
RF-118	PSP	23	0	82	30	0	24	0	13	18	0	12	0	34	25	0
RF-119	PSP	32	0	67	47	0	12	1	11	29	0	25	0	16	13	0
RF-120	PSP	8	0	48	15	0	53	1	15	3	0	22	0	9	2	0

Abbreviations: AD, Alzheimer's disease; AP, astrocytic plaques; CB, coiled bodies; CBD, corticobasal degeneration; NI, neuronal inclusions; NP, neuritic plaques; PiD, Pick's disease; PSP, progressive supranuclear palsy; TA, tufted astrocytes.

Table S5: Quantitative burdens of cases in hold-out dataset (CP13) using Model 1

Case ID	Dx	Motor cortex					Caudate nucleus					Superior frontal gyrus				
		TA	AP	CB	NI	NP	TA	AP	CB	NI	NP	TA	AP	CB	NI	NP
HO-1	AD	0	0	3	74	19	0	0	0	14	0	0	0	8	147	4
HO-2	AD	0	0	1	66	17	0	0	0	2	0	1	0	0	45	1
HO-3	AD	1	0	1	128	8	0	0	0	15	0	0	0	0	100	1
HO-4	AD	2	0	2	12	16	1	0	0	20	1	0	0	0	139	16
HO-5	AD	0	0	0	57	3	0	0	0	16	1	0	0	0	170	12
HO-6	AD	1	1	0	43	49	0	1	0	7	0	0	0	0	128	16
HO-7	AD	0	1	2	33	46	0	0	0	11	0	0	0	0	120	4
HO-8	AD	0	0	0	81	30	0	0	1	17	0	0	0	0	174	5
HO-9	AD	0	0	0	1	2	0	0	0	7	0	0	2	1	54	3
HO-10	AD	0	0	0	30	32	4	2	0	16	0	0	0	0	153	12
HO-11	CBD	0	2	1	113	0	1	6	1	156	4	0	13	1	99	3
HO-12	CBD	1	14	1	43	0	0	8	1	144	0	0	74	1	60	0
HO-13	CBD	0	3	0	65	0	0	0	3	128	0	1	1	2	108	0
HO-14	CBD	0	4	0	43	0	0	4	1	191	0	0	3	2	128	0
HO-15	CBD	0	0	1	98	2	0	4	4	114	1	0	12	2	155	8
HO-16	CBD	0	2	0	104	0	0	0	0	57	0	0	0	4	213	4
HO-17	CBD	0	4	5	159	8	0	3	1	198	0	0	12	3	230	12
HO-18	CBD	0	5	3	170	16	0	12	1	160	1	0	23	5	189	25
HO-19	CBD	0	0	7	138	0	1	0	1	190	0	0	1	4	175	0
HO-20	CBD	0	1	2	83	3	0	8	1	217	5	0	10	2	95	6
HO-21	CBD	0	0	3	53	0	0	1	1	49	1	1	2	7	62	1
HO-22	CBD	0	1	7	43	0	0	21	3	123	1	1	7	5	57	1
HO-23	CBD	0	48	2	203	13	0	23	0	96	1	0	51	0	135	8
HO-24	PiD	0	0	2	46	0	0	0	0	139	0	0	0	2	189	0
HO-25	PiD	0	0	0	1	0	0	0	0	172	0	0	0	0	273	0
HO-26	PiD	0	0	0	4	0	0	0	2	636	0	0	0	20	154	1
HO-27	PiD	0	0	1	14	0	0	0	5	199	0	0	0	8	155	0
HO-28	PiD	0	0	0	0	0	0	0	7	264	0	2	1	2	245	2
HO-29	PiD	0	0	0	4	0	0	0	1	452	0	0	0	15	137	0
HO-30	PiD	8	0	1	17	0	0	0	1	493	0	0	0	6	318	1
HO-31	PiD	3	0	1	52	0	0	0	4	822	0	5	0	12	240	1
HO-32	PiD	3	0	0	47	0	0	0	0	443	7	0	0	4	171	0
HO-33	PiD	0	0	0	0	0	0	0	0	35	0	0	0	2	74	0
HO-34	PSP	9	0	58	49	1	104	4	14	27	0	45	0	31	25	1
HO-35	PSP	1	0	3	3	0	18	2	4	15	3	0	0	0	2	0
HO-36	PSP	3	0	34	37	0	20	0	3	12	0	30	0	19	24	0
HO-37	PSP	9	0	46	12	0	16	1	18	22	0	7	0	13	8	0
HO-38	PSP	146	1	28	25	0	4	1	1	1	0	91	4	21	18	0
HO-39	PSP	32	0	54	31	0	86	2	4	19	1	52	2	6	14	0
HO-40	PSP	15	0	32	17	0	107	3	6	18	1	46	0	47	26	0
HO-41	PSP	15	4	5	14	5	7	2	4	23	7	1	1	2	56	45
HO-42	PSP	0	0	14	10	0	0	0	0	7	0	0	0	0	2	0
HO-43	PSP	1	0	53	25	0	25	0	9	17	0	23	0	9	15	0
HO-44	PSP	29	1	29	14	0	0	0	1	21	0	9	0	14	20	0
HO-45	PSP	3	0	88	35	0	0	0	0	19	0	3	0	17	19	0
HO-46	PSP	75	0	48	79	0	9	0	3	7	0	5	0	6	26	2
HO-47	PSP	80	0	53	86	1	0	0	2	12	0	40	1	18	41	1
HO-48	PSP	11	0	47	28	1	37	3	3	17	0	10	0	10	11	0
HO-49	PSP	205	0	13	48	0	103	5	2	12	0	33	1	7	7	1
HO-50	PSP	3	3	14	39	56	3	1	3	38	7	0	0	1	112	33

Abbreviations: AD, Alzheimer's disease; AP, astrocytic plaques; CB, coiled bodies; CBD, corticobasal degeneration; NI, neuronal inclusions; NP, neuritic plaques; PiD, Pick's disease; PSP, progressive supranuclear palsy; TA, tufted astrocytes.

Table S6: Quantitative burdens of cases in hold-out dataset (AT8) using Model 1

Case ID	Dx	Motor cortex					Caudate nucleus					Superior frontal gyrus				
		TA	AP	CB	NI	NP	TA	AP	CB	NI	NP	TA	AP	CB	NI	NP
HO-1	AD	1	0	13	114	14	0	0	0	31	0	0	0	3	157	7
HO-2	AD	1	2	4	69	23	0	0	0	1	0	0	0	1	55	0
HO-3	AD	1	2	16	109	6	0	0	0	15	0	0	0	2	107	1
HO-4	AD	1	4	0	20	19	4	1	0	17	4	0	0	0	161	14
HO-5	AD	0	2	0	38	58	0	0	0	17	0	0	1	0	150	12
HO-6	AD	0	3	1	42	19	0	2	0	2	0	0	1	0	75	2
HO-7	AD	8	3	1	17	15	0	0	0	11	0	0	0	0	90	4
HO-8	AD	0	6	0	63	23	1	0	3	22	0	0	0	0	118	7
HO-9	AD	0	1	1	1	4	0	0	0	16	0	0	11	2	62	16
HO-10	AD	0	0	0	36	35	0	5	1	5	3	0	0	0	110	5
HO-11	CBD	0	2	0	112	1	0	6	0	129	6	8	17	5	79	1
HO-12	CBD	2	27	0	31	1	0	104	0	155	2	6	81	2	62	0
HO-13	CBD	0	2	1	56	0	0	25	0	133	11	0	4	1	70	0
HO-14	CBD	0	0	2	30	0	0	0	1	65	0	0	0	5	120	0
HO-15	CBD	0	0	10	136	1	0	7	3	155	0	0	4	1	126	6
HO-16	CBD	0	0	4	78	0	0	0	0	26	0	0	4	18	167	0
HO-17	CBD	0	11	9	182	11	0	18	0	179	0	0	39	4	234	4
HO-18	CBD	4	11	11	138	5	0	22	1	55	0	9	21	1	82	0
HO-19	CBD	1	0	2	120	1	0	5	0	196	1	0	11	0	133	1
HO-20	CBD	0	2	4	33	0	0	12	0	276	2	2	12	0	103	0
HO-21	CBD	0	0	5	58	0	0	2	0	28	0	0	0	1	73	0
HO-22	CBD	0	0	5	49	0	0	36	2	129	3	1	9	0	43	0
HO-23	CBD	0	1	3	92	0	0	9	1	59	0	0	11	4	145	0
HO-24	PiD	0	0	1	43	0	0	1	0	154	0	0	0	0	225	2
HO-25	PiD	0	0	0	1	0	0	0	1	113	0	0	1	1	133	8
HO-26	PiD	0	0	0	8	0	0	0	4	727	0	3	1	13	161	4
HO-27	PiD	0	1	2	91	0	0	4	14	411	0	4	1	10	268	3
HO-28	PiD	1	3	3	12	0	0	0	0	255	0	0	0	0	220	0
HO-29	PiD	0	0	0	8	1	0	0	1	655	2	0	3	11	138	0
HO-30	PiD	1	0	5	77	0	0	0	4	428	0	0	1	2	345	0
HO-31	PiD	5	1	2	49	0	0	0	3	770	0	13	8	7	241	3
HO-32	PiD	1	0	0	53	0	1	0	0	415	3	0	0	1	182	0
HO-33	PiD	0	0	0	0	0	0	0	3	147	0	0	0	1	172	2
HO-34	PSP	9	2	69	53	4	113	7	10	27	5	42	7	29	24	0
HO-35	PSP	2	0	3	4	0	10	1	0	12	0	0	0	0	3	0
HO-36	PSP	3	0	22	15	0	3	2	1	15	0	16	0	29	27	0
HO-37	PSP	12	1	43	12	0	15	2	4	19	0	9	2	29	13	0
HO-38	PSP	104	8	34	44	2	4	1	0	1	0	95	1	20	15	0
HO-39	PSP	18	0	32	32	0	58	2	6	20	2	26	0	8	26	0
HO-40	PSP	26	0	53	23	1	65	3	4	23	2	27	1	25	30	0
HO-41	PSP	21	0	6	12	1	12	0	1	19	2	0	1	1	37	29
HO-42	PSP	1	0	11	12	0	0	0	0	3	0	0	0	1	4	0
HO-43	PSP	3	0	18	26	0	17	0	2	19	0	13	1	4	22	0
HO-44	PSP	30	0	46	18	0	0	0	1	30	0	21	1	8	18	0
HO-45	PSP	14	0	27	31	0	0	0	1	27	0	12	1	15	18	0
HO-46	PSP	38	2	38	104	0	0	0	0	7	0	1	1	3	64	2
HO-47	PSP	10	0	52	55	1	0	0	0	3	0	39	1	23	49	1
HO-48	PSP	6	0	42	24	0	41	4	3	14	1	10	1	26	11	0
HO-49	PSP	107	1	17	34	0	37	1	4	12	0	21	0	8	5	0
HO-50	PSP	2	2	2	39	15	6	5	2	36	11	0	0	3	92	10

Abbreviations: AD, Alzheimer's disease; AP, astrocytic plaques; CB, coiled bodies; CBD, corticobasal degeneration; NI, neuronal inclusions; NP, neuritic plaques; PiD, Pick's disease; PSP, progressive supranuclear palsy; TA, tufted astrocytes.

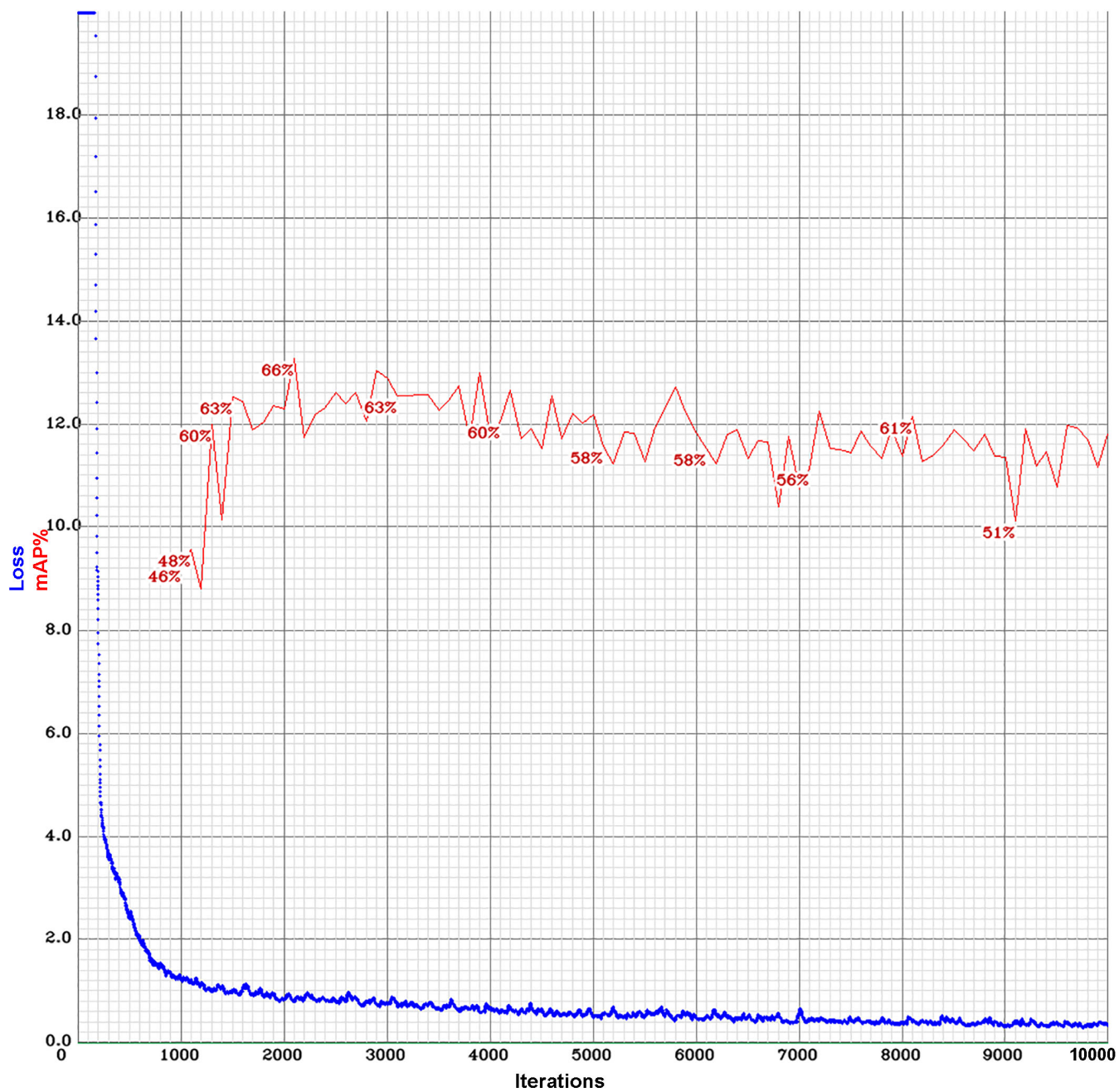


Figure S1: Training loss and mAP during training in Model 1

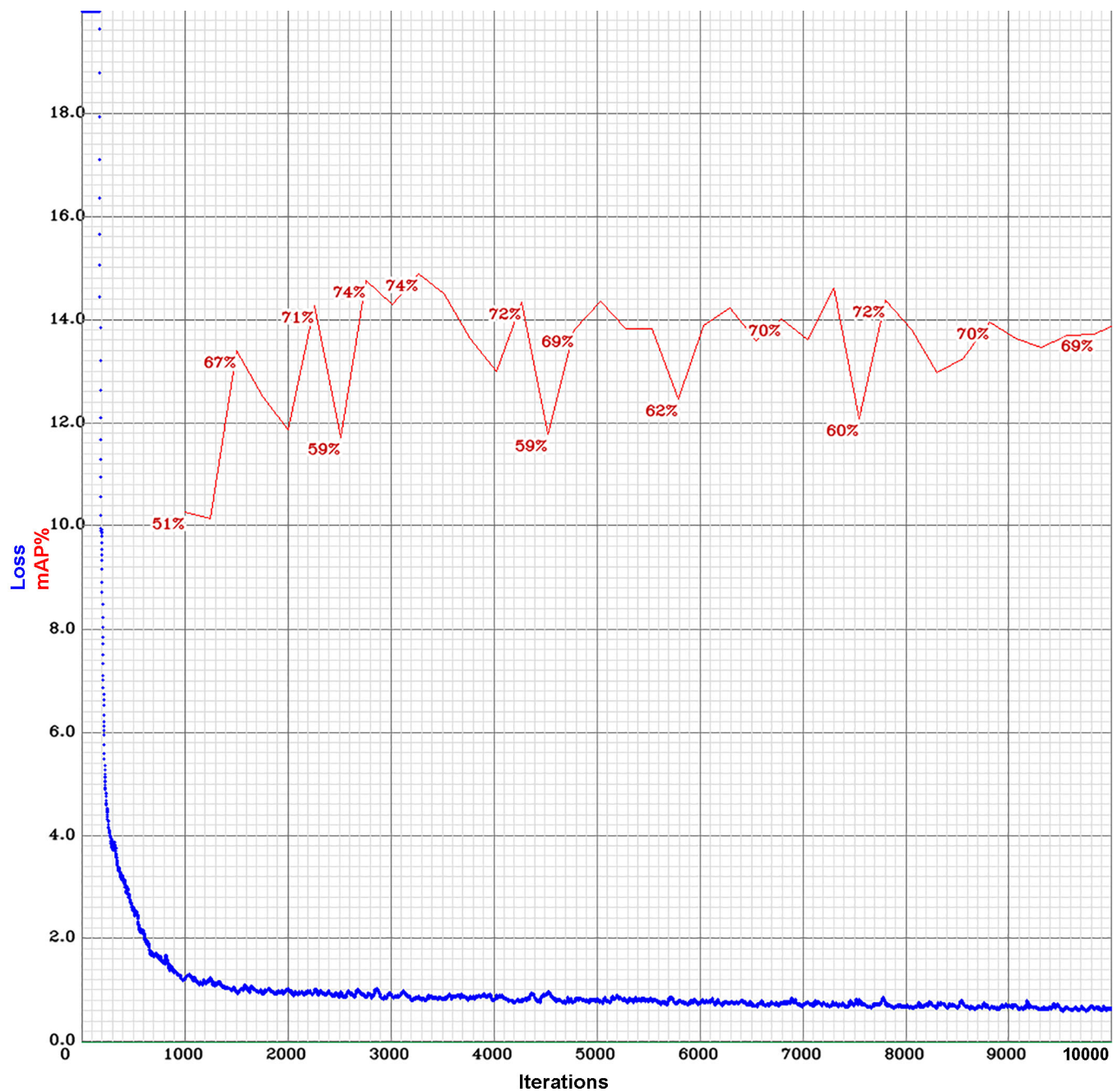


Figure S2: Training loss and mAP during training in Model 2

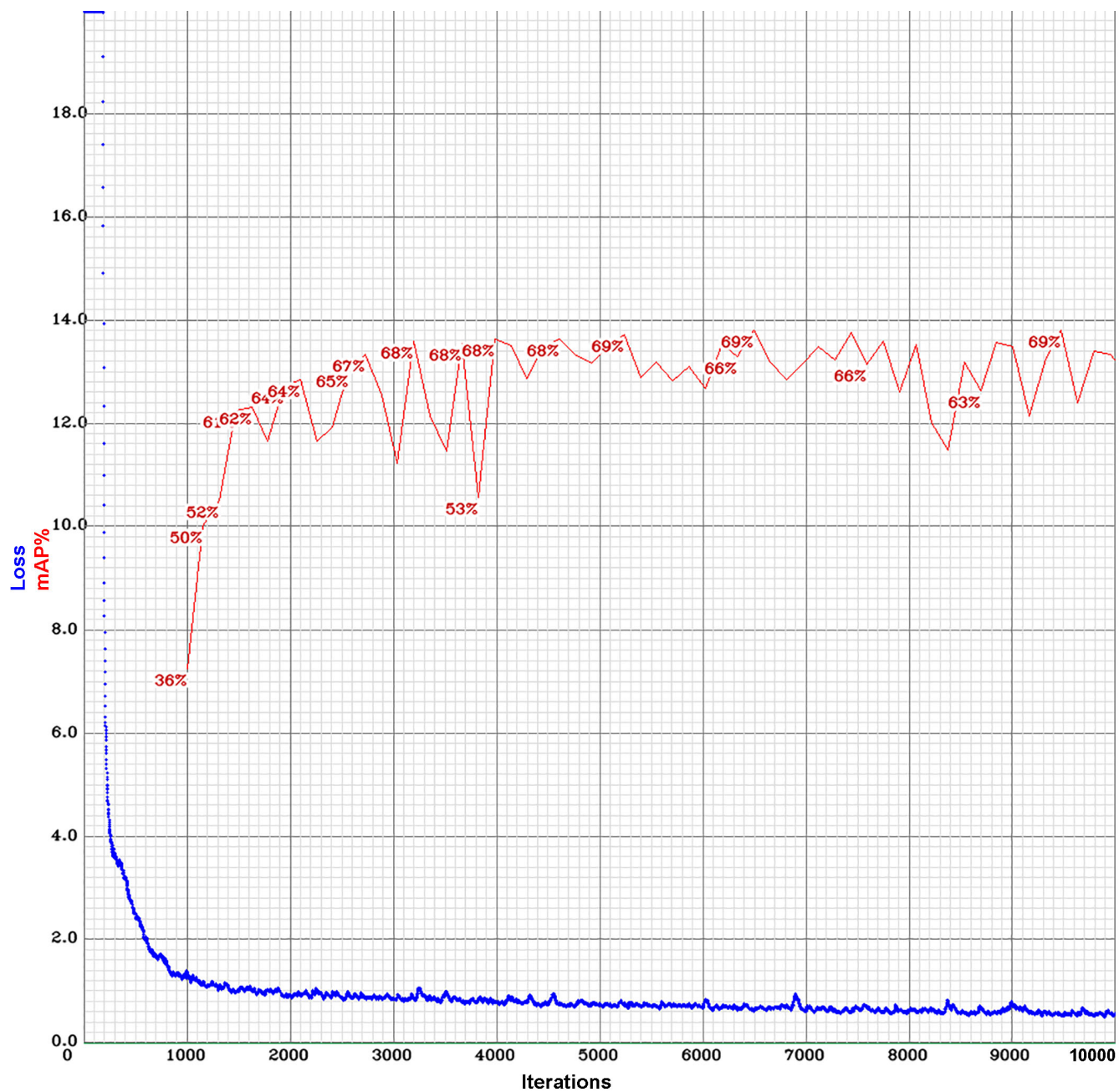


Figure S3: Training loss and mAP during training in Model 3

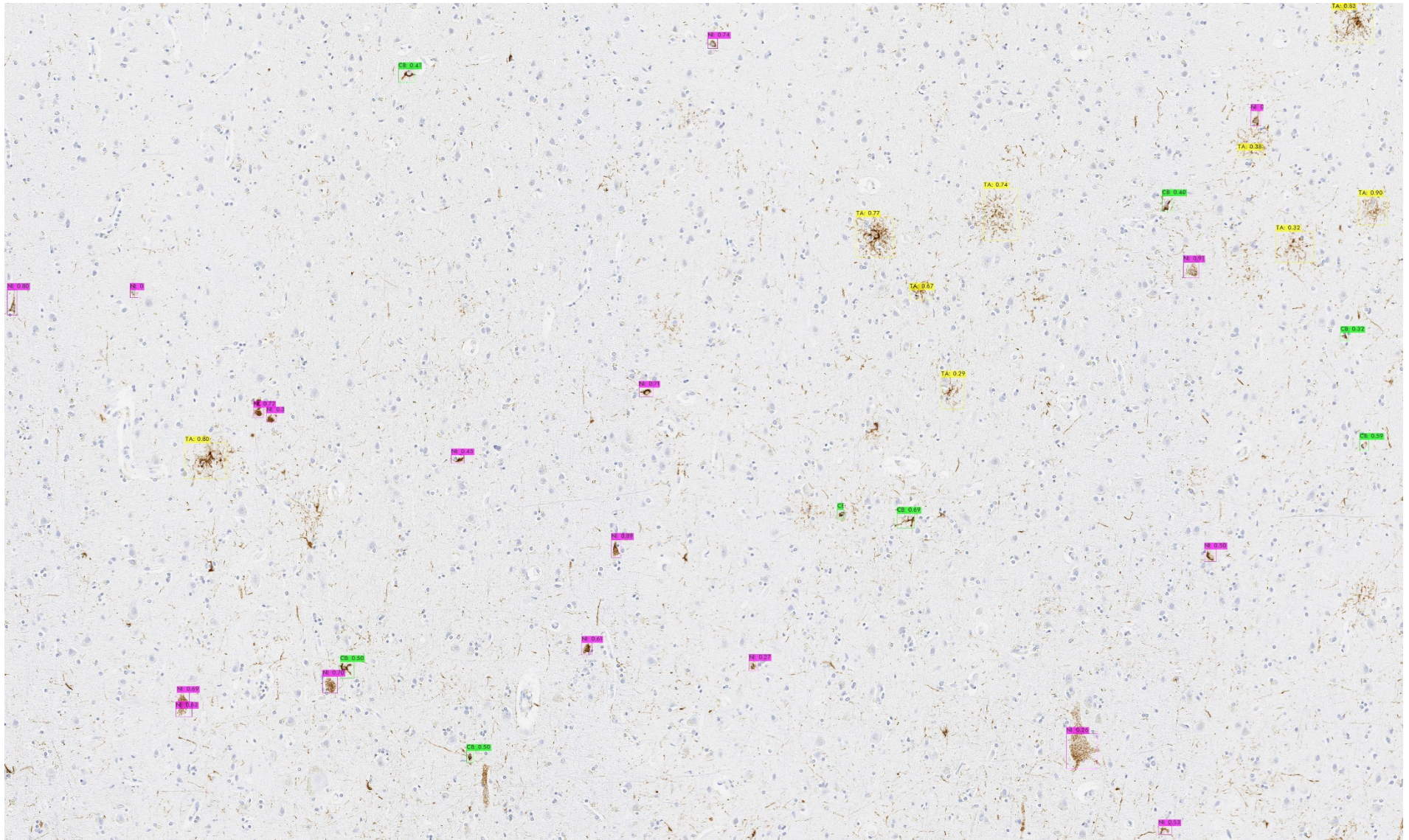


Figure S4: Representative image with bounding box. The motor cortex from a patient with PSP+AD (RF-96).

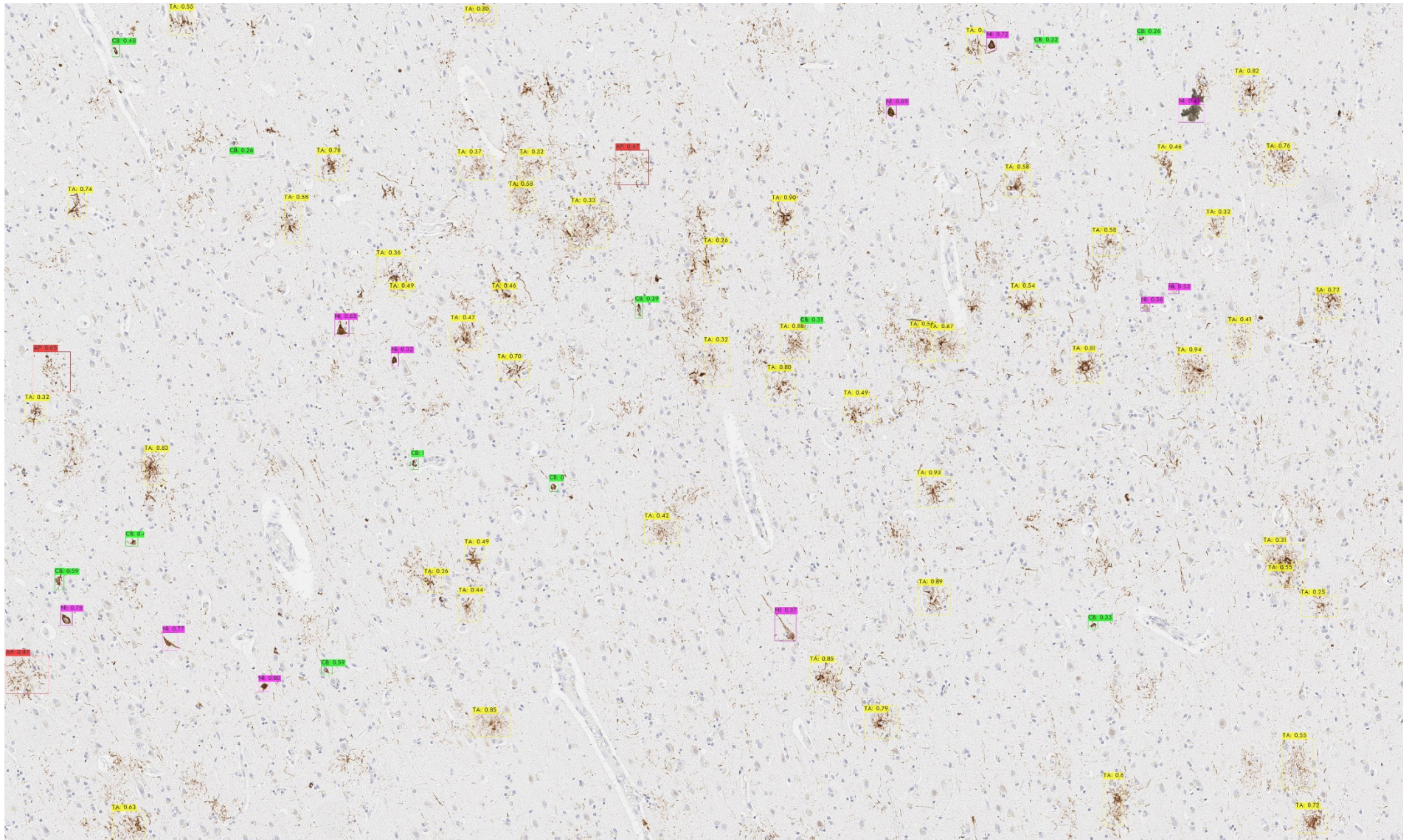


Figure S6: Representative image with bounding box. The superior frontal gyrus from a patient with PSP+AD (RF-96).

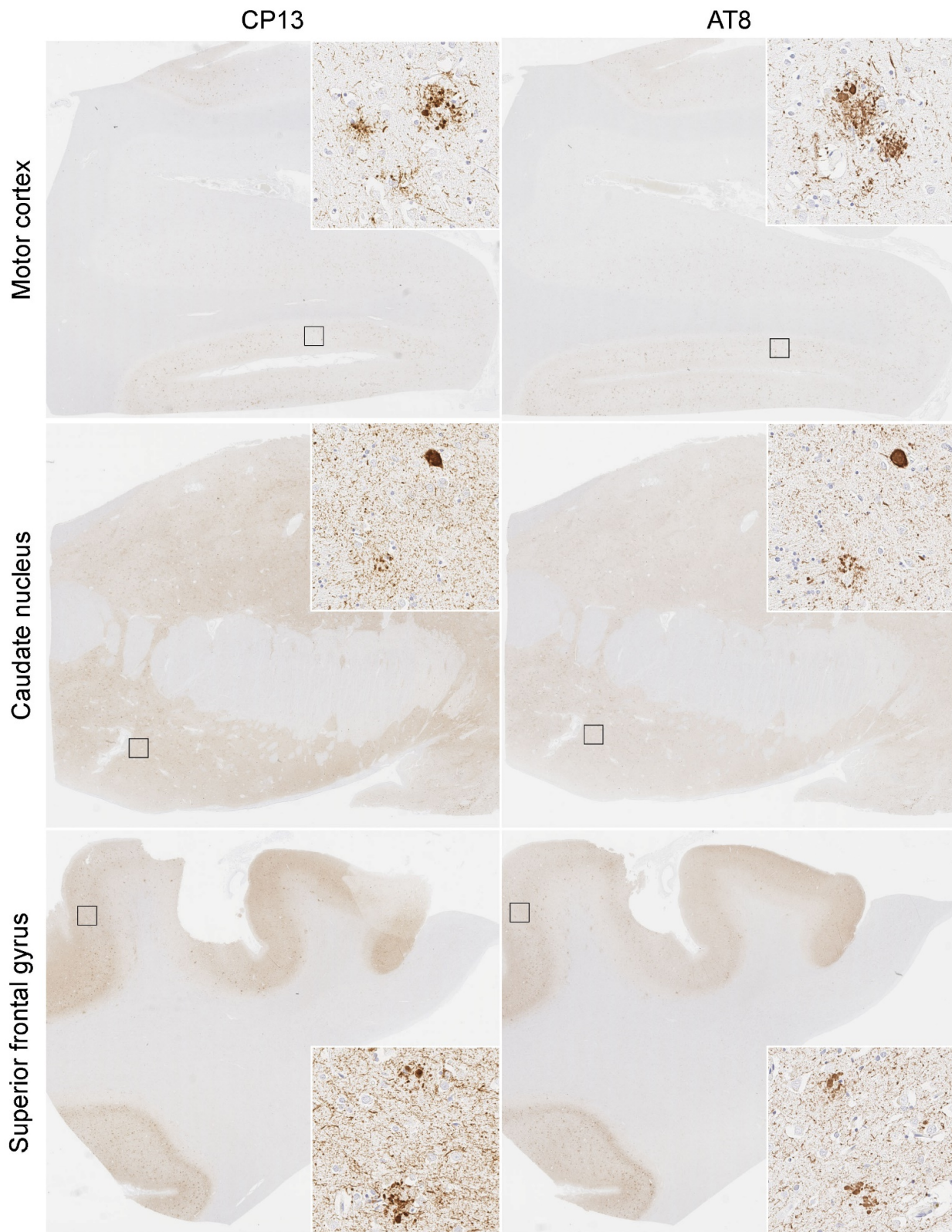


Figure S7: Comparison between CP13- and AT8-stained slides. Representative images are taken from a patient with PSP+AD (HO-41). Tufted astrocytes, neuritic plaques, and neuronal inclusions are present in the motor cortex, caudate nucleus, and superior frontal gyrus.