

Appendix

Appendix A - ICD codes Complications

Complication	ICD-10 Codes	ICD-9 Codes
Cerebrovascular Diseases	I60 - I69, G45	430-438
Cardiac Diseases	I20-I28, I130-I152, I11	410-417, 420-429, 402
Renal Diseases	N17-N19, I12	584-586, 403

Appendix B - Included Features

Diagnosis

ICD Code	Content
Diagnosis__ICD-9__244.9	Unspecified acquired hypothyroidism
Diagnosis__ICD-9__250.00	Diabetes mellitus without mention of complication, type II or unspecified type, not stated as uncontrolled

Diagnosis__ICD-9__272.0	Pure hypercholesterolemia
Diagnosis__ICD-9__272.4	Other and unspecified hyperlipidemia
Diagnosis__ICD-9__311	Depressive disorder, not elsewhere classified
Diagnosis__ICD-9__414.00	Coronary atherosclerosis of unspecified type of vessel, native or graft
Diagnosis__ICD-9__414.01	Coronary atherosclerosis of native coronary artery
Diagnosis__ICD-9__493.90	Asthma,unspecified type, unspecified
Diagnosis__ICD-9__530.81	Esophageal reflux
Diagnosis__ICD-9__786.05	Shortness of breath
Diagnosis__ICD-9__786.50	Chest pain, unspecified
Diagnosis__ICD-9__V14	Personal history of allergy to medicinal agents
Diagnosis__ICD-9__V14.0	Personal history of allergy to penicillin
Diagnosis__ICD-9__V15.0	Personal history of allergy, other than to medicinal agents, presenting hazards to health
Diagnosis__IMO__114039	Hyperlipidemia
Diagnosis__IMO__134988	Gerd (gastroesophageal reflux disease)

Diagnosis__IMO__94485	Diabetes mellitus
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Drugs/ Medication

Drug Name	Content
Drug__COMPURECORD__Cefazolin	Cefazolin
Drug__COMPURECORD__Fentanyl	Fentanyl
Drug__COMPURECORD__Glycopyrrolate	Glycopyrrolate
Drug__COMPURECORD__Midazolam	Midazolam
Drug__COMPURECORD__Neostigmine	Neostigmine
Drug__COMPURECORD__Ondansetron	Ondansetron
Drug__COMPURECORD__Propofol	Propofol
Drug__COMPURECORD__Vecuronium	Vecuronium
Drug__EPIC IMMUNIZATION__51	Influenza vaccine
Drug__EPIC MEDICATION__1451	Acetaminophen 325 mg tablet
Drug__EPIC MEDICATION__16330	Aspirin 81 mg tab
Drug__EPIC MEDICATION__9554	Oxycodone-acetaminophen 5 mg-325 mg tablet
Drug__TDS ALLERGY__10001-MEDS	ALLERGY Meds

Drug__TDS ALLERGY__12336-MEDS	ALLERGY Meds
Drug__TDS__01060-ACETAMINOPHEN TABS	Acetaminophen tabs
Drug__TDS__08510-DOCUSATE SODIUM CAP	Docusate sodium cap
Drug__TDS__11430-HEPARIN SODIUM INJ	Heparin sodium inj
Drug__TDS__17220-OXYCODONE/ACETAMINOPHEN 5/325	Oxycodone/acetaminophen 5/325
Drug__TDS__20535-SODIUM CHLORIDE 0.9%	Sodium chloride 0.9%

Laboratory Values

Laboratory Value Name
ALBUMIN, BLD
ALK PHOSPHATASE, BLD
ALT(SGPT)
AMYLASE, BLD
APTT
APTT - SL
AST (SGOT)
ATRIAL RATE

BASOPHIL #
BASOPHIL %
BILIRUBIN DIRECT
BILIRUBIN TOTAL
CALCIUM, BLD
CARBON DIOXIDE-BLD
CHLORIDE-BLD
CHOL/HDL CHOL RATIO
CHOLESTEROL
CPK-BLD
CREATININE-SERUM
EGFR AFRICAN AM
EGFR NON-AFRICAN AM
EOSINOPHIL #
EOSINOPHIL %
GAMMA GTP-BLD
GLUCOSE
HDL CHOLESTEROL
HEMATOCRIT
HEMATOCRIT , VEN
HEMOGLOBIN

INR
INR - SL
LDH-BLD
LDL CHOLESTEROL
LDL/HDL RATIO
LYMPHOCYTE #
LYMPHOCYTE %
MAGNESIUM-BLD
MEAN CORP. HGB
MEAN CORP. HGB CONC.
MEAN CORP. VOLUME
MEAN PLT VOLUME
MONOCYTE #
MONOCYTE %
NEUTROPHIL #
NEUTROPHIL %
P AXIS
P-R INTERVAL
PHOSPHORUS-BLD
PLATELET
POTASSIUM BLD

PRO TIME
PROTEIN TOTAL-BLD
PROTHROMBIN TIME - SL
QRS DURATION
QT
QTC
R AXIS
RBC BLOOD CELL
RED DISTRIB. WIDTH
SODIUM-BLD
T AXIS
TRIGLYCERIDES
TROPONIN-I
TSH
U-PH
U-SPECIFIC GRAVITY
UREA NITROGEN-BLD
URIC ACID-BLD
UROBILINOGEN
VENTRICULAR RATE
WB CHLORIDE, VEN

WB CO2, VEN
WB CREATININE, VEN
WB GLUCOSE , VEN
WB POTASSIUM , VEN
WB SODIUM , VEN
WB UREA NITROGEN, VEN
WHITE BLOOD CELL

Vital Signs

Vital Sign Feature Code	Feature Name
RESP	Respirations
T-O	Temperature
T-T	Temperature
DBP	Diastolic blood pressure
PAIN SCORE	Pain score
PULSE	Pulse
PULSE OXIMETRY	O2 saturation
SBP	Systolic blood pressure

TEMPERATURE	Temperature
RESP	Respirations
P-R	Pulse
ADMIT WT	Admit wt
APS PAIN NOW	Pain now
APS WORST EXPERIENCED	Worst experienced

Procedures

Feature Code	Feature Name
6TEST	6-test
AMY	Hemoglobin a1c
APT-S	Ptt-stat lab
APTT	Partial thromboplastin time
AST	Ast (sgot)
BMP	Basic metabolic panel
C&P	Cbc+platelet
CMP	Comprehensive metabolic panel

CPD	Cbc+plt+diff
CREA	Creatinine-serum
CTP	Cbc+platelet
EGFRG	Egfr test calculation
ER-VP	Venous panel (er)
HFP	Hepatic function panel
LIPID	Lipid panel
LIV	Liver transp monit
MG-H	Magnesium-blood
P9117	Chem 7
PM	Pat. monitoring
PO4	Phosphorus-blood
PRO	Prothrombin time
PT	Prothrombin time
PT-S	Pt-stat lab
SLIDE	Bld smear
TS-G	Type and screen
TSH	Tsh
UCHEM	Urinalysis
UMIC	Microscopic exam of urine

71010	Radiologic examination
71020	Radiologic examination
80048	Basic metabolic panel (calcium
80053	Comprehensive metabolic panel this panel must include the following: albumin (82040)
80061	Lipid panel this panel must include the following: cholesterol
80076	Hepatic function panel this panel must include the following: albumin (82040)
81003	Urinalysis
81015	Urinalysis; microscopic only
82565	Creatinine; blood
83735	Magnesium
84100	Phosphorus inorganic (phosphate);
84443	Thyroid stimulating hormone (tsh)
84450	Transferase; aspartate amino (ast) (sgot)

85008	Blood count; blood smear
85025	Blood count; complete (cbc)
85027	Blood count; complete (cbc)
85610	Prothrombin time;
85730	Thromboplastin time
93000	Electrocardiogram
93000-ELECTROCARDIOGRAM	Electrocardiogram complete
100001	Surgical pathology
100070	6-test
100084	Pat. monitoring
100107	Venous panel (er)
100269	Egfr test calculation
100314	Tsh
100516	Type and screen
101071	Cytopathology
(RESP)	Respirations
(T-O)	Temperature
(T-T)	Temperature
114290	Tsh

117280	Liver transp monit
117417	Chem 7
119049	Type and screen
151490	Cytopathology
6029	Basic metabolic panel
6032	Comprehensive metabolic panel
6034	Lipid panel
6037	Hepatic function panel
6104	Urinalysis
6107	Microscopic exam of urine
61970	Surgical pathology
62452	Creatinine-serum
63072	Bld smear
63108	Pt-stat lab
63112	Ptt-stat lab
6372	Magnesium-blood
6432	Phosphorus-blood
64416	6-test
64444	Pat. monitoring
64490	Venous panel (er)

64824	Egfr test calculation
64914	X-ray chest 1 view portable
64924	X-ray chest pa and lateral only
6501	Ast (sgot)
6550	Cbc+plt+diff
6551	Cbc+platelet
6624	Prothrombin time
6635	Partial thromboplastin time
7509	Electrocardiogram
BP SITE	Bp site
DBP	Diastolic blood pressure
HEIGHT	Height
PAIN SCORE	Pain score
PULSE	Pulse
PULSE OXIMETRY	O2 saturation
R APACHE TEMPERATURE	R apache temperature
SBP	Systolic blood pressure
TEMPERATURE	Temperature

WEIGHT	Weight
89.02	Interview and evaluation, described as limited
CH2PAL-PA	CH2PAL-PA,LL, CXR
93000	Electrocardiogram
10430	Pathology
100001	Surgical pathology
ADMISSION	Admission
CARDIOLOGY	Cardiology
DIET	Diet
MDNUR	Md to nurse
(P-R)	Pulse
ADMIT WT	Admit wt
APS NOW	APS Now
APS PAIN LEVEL IS ACCEPTABLE TO PATIENT	Pain level is acceptable to patient
APS PAIN NOW	Pain now
APS WORST EXPERIENCED	Worst experienced

Appendix C - All Machine Learning Results

All3 Cohort

Post-HTN Blood Pressure

Model	Sample A AUC	Sample A AUPRC	Sample A Recall	Sample A Precision	Sample A F1	Sample A Accuracy	Sample A Brier	Sample B AUC	Sample B AUPRC	Sample B Recall	Sample B Precision	Sample B F1	Sample B Accuracy	Sample B Brier
LGBM	0.937482 419	0.956547 141	0.827369 996	0.918755 607	0.867746 67	0.867746 67	0.094892 649	0.936940 325	0.935795 678	0.836134 454	0.911172 161	0.914644 841	0.914644 841	0.069727 081
Catboost	0.938263 052	0.957018 14	0.831357 889	0.917144 293	0.868819 147	0.868819 147	0.093879 063	0.936847 666	0.935592 543	0.838655 462	0.911415 525	0.915521 777	0.915521 777	0.069134 822
LGBM simple impute (mean)	0.936627 063	0.955967 906	0.829258 768	0.913783 856	0.866053 285	0.866053 285	0.095365 295	0.936740 505	0.935533 625	0.836134 454	0.912007 333	0.914937 153	0.914937 153	0.069576 16
XGBoost	0.936808 909	0.956193 231	0.823592 54	0.919350 275	0.866166 177	0.866166 177	0.095516 675	0.936411 678	0.935706 67	0.834453 782	0.943916 35	0.925168 08	0.925168 08	0.065470 846
XGBoost simple impute (mean)	0.936258 168	0.955876 577	0.816036 195	0.923796 713	0.864811 47	0.864811 47	0.095821 565	0.935922 016	0.935266 283	0.826050 42	0.947926 712	0.923706 519	0.923706 519	0.066635 503
Catboost simple impute (mean)	0.935959 467	0.955341 199	0.822018 607	0.919121 921	0.865150 147	0.865150 147	0.095609 572	0.935550 625	0.934313 727	0.834453 782	0.916051 661	0.915814 089	0.915814 089	0.070914 035
Random Forest	0.929738 605	0.950832 162	0.822228 206	0.909843 867	0.860521 562	0.860521 562	0.104586 419	0.935317 282	0.933078 877	0.828571 429	0.938154 139	0.921368 021	0.921368 021	0.077622 479
Logistic Regressio n simple impute (mean)	0.698231 615	0.730031 469	0.683808 39	0.665376 295	0.644840 822	0.644840 822	0.220420 61	0.627202 257	0.470144 431	0.439495 798	0.461199 295	0.626425 022	0.626425 022	0.231192 25

Logistic Regression iterative impute	0.703628713	0.735521368	0.679400682	0.674098053	0.650824114	0.650824114	0.21930422	0.615373142	0.452230314	0.435294118	0.459219858	0.625255773	0.625255773	0.236110322
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Pre-HTN features only

Model	Sample A AUC	Sample A AUPRC	Sample A Recall	Sample A Precision	Sample A F1	Sample A Accuracy	Sample A Brier	Sample B AUC	Sample B AUPRC	Sample B Recall	Sample B Precision	Sample B F1	Sample B Accuracy	Sample B Brier
LGBM	0.736637847	0.762727549	0.693379044	0.688752844	0.669710368	0.669710368	0.206925288	0.673120603	0.506514152	0.442523768	0.511488511	0.665289256	0.665289256	0.212447722
LGBM simple impute (mean)	0.735780221	0.762299131	0.694664667	0.688777284	0.670052762	0.670052762	0.207197819	0.677170552	0.51091257	0.456352636	0.511627907	0.665584416	0.665584416	0.211543016
XGBoost	0.73448761	0.761186535	0.700235697	0.689661527	0.672392945	0.672392945	0.207781939	0.663611707	0.501503455	0.413137424	0.507970244	0.662927981	0.662927981	0.213735327
XGBoost simple impute (mean)	0.735527803	0.76223027	0.700021427	0.690126622	0.672735658	0.672735658	0.207438016	0.672346952	0.510266964	0.414866033	0.519480519	0.669126328	0.669126328	0.211426575
Logistic Regression iterative impute	0.698978026	0.729805313	0.668309406	0.665251951	0.644141253	0.644141253	0.220719866	0.618111183	0.458851365	0.429559205	0.459334566	0.632526564	0.632526564	0.230945825
Logistic Regression simple impute (mean)	0.697564208	0.72755507	0.667988001	0.663382376	0.642486386	0.642486386	0.220787143	0.625643531	0.468217531	0.438202247	0.460072595	0.632526564	0.632526564	0.22838572

Catboost	0.738194939	0.766345225	0.707949432	0.685910209	0.671593858	0.671593858	0.206314795	0.67010348	0.514976864	0.443388073	0.500976563	0.659090909	0.659090909	0.2111111375
Catboost simple impute (mean)	0.736449013	0.76510829	0.691986287	0.685359031	0.66645723	0.66645723	0.206834155	0.668999952	0.508390561	0.468452895	0.498161765	0.657319953	0.657319953	0.212333599
Random Forest	0.720284168	0.741756379	0.692629098	0.674145107	0.657896212	0.657896212	0.213287903	0.657939105	0.475693793	0.429559205	0.494527363	0.655253837	0.655253837	0.218531287

Cerebro

Post-HTN Blood Pressure

Model	Sample A AUC	Sample A AUPRC	Sample A Recall	Sample A Precision	Sample A F1	Sample A Accuracy	Sample A Brier	Sample B AUC	Sample B AUPRC	Sample B Recall	Sample B Precision	Sample B F1	Sample B Accuracy	Sample B Brier
LGBM	0.708878486	0.511071214	0.827856025	0.440106685	0.591549296	0.591549296	0.196463779	0.743641998	0.534089446	0.768856448	0.5	0.666666667	0.666666667	0.190607458
LGBM simple impute (mean)	0.705087011	0.508966667	0.817423057	0.439115208	0.591027647	0.591027647	0.197321701	0.736612085	0.51902717	0.771289538	0.48844376	0.654501217	0.654501217	0.192196153
XGBoost	0.706645901	0.513575254	0.820552947	0.438430038	0.589897409	0.589897409	0.197000597	0.742055458	0.530313243	0.754257908	0.509031199	0.675587997	0.675587997	0.191786326
XGBoost simple	0.704315083	0.508540731	0.820031299	0.437624037	0.588767171	0.588767171	0.19763079	0.73454307	0.524099593	0.746958637	0.496763754	0.663422547	0.663422547	0.194083698

impute (mean)														
Logistic Regressio n iterative impute	0.6483168 61	0.4596349 86	0.6690140 85	0.4269195 6	0.5903321 16	0.5903321 16	0.2158143 68	0.6420841 7	0.4595347 3	0.5571776 16	0.458	0.6326034 06	0.6326034 06	0.2166988 09
Logistic Regressio n simple impute (mean)	0.6487223 83	0.4615830 46	0.6643192 49	0.4237021 97	0.5869414 01	0.5869414 01	0.2150296 03	0.6251265 38	0.4361739 55	0.5620437 96	0.44	0.6155717 76	0.6155717 76	0.2221026 03
Catboost	0.6716777 36	0.4683431 71	0.0015649 45	0.3333333 33	0.6669274 91	0.6669274 91	0.3181178 59	0.6981192 39	0.5006069 49	0	0	0.6666666 67	0.6666666 67	0.3206914 75
Catboost simple impute (mean)	0.6624210 28	0.4602786 63	0.0005216 48	0.5	0.6668405 49	0.6668405 49	0.3205394 1	0.6851279 59	0.4887566 17	0	0	0.6666666 67	0.6666666 67	0.3249058 93
Random Forest	0.6837350 39	0.4895322 9	0.8038601 98	0.4213565 6	0.5666840 55	0.5666840 55	0.2022902 28	0.7224619 79	0.5158824 9	0.7615571 78	0.4815384 62	0.6472019 46	0.6472019 46	0.1954142 74

Pre-HTN features only

Model	Sample A AUC	Sample A AUPRC	Sample A Recall	Sample A Precision	Sample A F1	Sample A Accuracy	Sample A Brier	Sample B AUC	Sample B AUPRC	Sample B Recall	Sample B Precision	Sample B F1	Sample B Accuracy	Sample B Brier
LGBM	0.6769291 6	0.4928609 72	0.7635566 83	0.4284316 84	0.5816101 7	0.5816101 73	0.2032249 83	0.6731075 92	0.4671892 89	0.6316472 11	0.4682692 31	0.6381322 95	0.6381322 96	0.2073484 32
LGBM simple impute (mean)	0.6809384 58	0.4909739 09	0.7626027 02	0.4281958 81	0.5807601 5	0.5807601 5	0.2032911 96	0.6621215 57	0.4609869 02	0.6550868 49	0.4306688 42	0.5963606 29	0.5963606 29	0.2076918 6

XGBoost	0.6775898 14	0.4885703 61	0.7533682 91	0.4327779 19	0.5884103 96	0.5884103 96	0.2038988 68	0.6518635 05	0.4569612 09	0.6029776 67	0.4550561 8	0.6269644 33	0.6269644 33	0.2111356 95
XGBoost simple impute (mean)	0.6792472 55	0.4910188 98	0.7570599 96	0.4312955 77	0.5860363 29	0.5860363 29	0.2035832 35	0.6533181 66	0.4549255 5	0.5930521 09	0.4492481 2	0.6220016 54	0.6220016 54	0.2110713 65
Logistic Regressio n iterative impute	0.6469575 55	0.4596325 91	0.6631482 19	0.4255241 51	0.5892904 76	0.5892904 76	0.2157011 1	0.6051204 06	0.4196166 67	0.4714640 2	0.4121475 05	0.5996691 48	0.5996691 48	0.2277869 78
Logistic Regressio n simple impute (mean)	0.6474634 07	0.4613857 85	0.6668415 94	0.4231692 72	0.5859492 6	0.5859492 6	0.2149043 81	0.6136882 81	0.4297322 49	0.5260545 91	0.4124513 62	0.5922249 79	0.5922249 79	0.2244751 49
Catboost	0.6538331 34	0.4603616 45	0	0	0.6666666 72	0.6666666 72	0.3215806 18	0.6197085 75	0.4105524 08	0	0	0.6666666 67	0.6666666 67	0.3300737 06
Catboost simple impute (mean)	0.6062952 18	0.4343593 45	0.0002638 52	0.25	0.6666666 72	0.6666666 72	0.3143258 82	0.5718079 05	0.3856151 3	0	0	0.6666666 67	0.6666666 67	0.3165470 88
Random Forest	0.6609140 47	0.4708533 23	0.7668139 01	0.4104786 15	0.5551740 15	0.5551740 15	0.2069941 64	0.6476549 94	0.4525142 36	0.6352357 32	0.4413793 1	0.6104218 36	0.6104218 36	0.2100885 03

Cardiac

Post-HTN Blood Pressure

Model	Sample A AUC	Sample A AUPRC	Sample A Recall	Sample A Precision	Sample A F1	Sample A Accuracy	Sample A Brier	Sample B AUC	Sample B AUPRC	Sample B Recall	Sample B Precision	Sample B F1	Sample B Accuracy	Sample B Brier
LGBM simple impute (mean)	0.849772 686	0.795540 612	0.754058 244	0.766053 205	0.785326 572	0.785326 572	0.154509 374	0.875932 731	0.764657 945	0.736890 524	0.728844 404	0.844763 424	0.844763 424	0.120326 406
LGBM	0.851461 54	0.801896 603	0.754281 438	0.764179 524	0.784260 273	0.784260 273	0.154018 945	0.877873 595	0.768843 489	0.741490 34	0.732061 762	0.846889 952	0.846889 952	0.120197 044
XGBoost	0.65625	0.759896 825	0.75	0.652142 857	0.623611 111	0.623611 111	0.245266 48	0.975	0.966666 667	0.8	0.8	0.846153 846	0.846153 846	0.091013 404
XGBoost simple impute (mean)	0.7075	0.716607 143	0.441666 667	0.583333 333	0.661111 111	0.661111 111	0.221460 387	0.803571 429	0.582142 857	0.5	0.333333 333	0.666666 667	0.666666 667	0.177660 805
Logistic Regressio n iterative impute	0.682140 82	0.636318 564	0.507550 631	0.615587 132	0.635186 946	0.635186 946	0.223272 294	0.624849 324	0.399658 9	0.289788 408	0.433884 298	0.685539 607	0.685539 607	0.207499 594
Logistic Regressio n simple impute (mean)	0.677547 468	0.630215 105	0.490199 656	0.610815 919	0.629449 152	0.629449 152	0.224429 82	0.626181 981	0.405156 879	0.310947 562	0.420398 01	0.677033 493	0.677033 493	0.207865 14
Catboost	0.850431 78	0.802423 215	0.752818 489	0.764931 004	0.784260 015	0.784260 015	0.154662 227	0.873243 687	0.745189 275	0.742410 304	0.737659 963	0.849282 297	0.849282 297	0.120981 678
Catboost simple impute (mean)	0.846758 663	0.797991 317	0.749552 089	0.762288 726	0.781721 763	0.781721 763	0.156320 05	0.872546 235	0.746399 019	0.735050 598	0.732355 637	0.845826 688	0.845826 688	0.122323 775
Random Forest	0.836168 602	0.772436 76	0.728709 995	0.760429 579	0.774257 978	0.774257 978	0.164540 644	0.869998 71	0.746980 169	0.711131 555	0.745419 479	0.846358 32	0.846358 32	0.126591 893

Pre-HTN features only

Model	Sample A AUC	Sample A AUPRC	Sample A Recall	Sample A Precision	Sample A F1	Sample A Accuracy	Sample A Brier	Sample B AUC	Sample B AUPRC	Sample B Recall	Sample B Precision	Sample B F1	Sample B Accuracy	Sample B Brier
LGBM simple impute (mean)	0.715607 705	0.676338 161	0.527852 785	0.652546 247	0.662974 359	0.662974 359	0.211824 122	0.654557 996	0.414674 153	0.229166 667	0.438405 797	0.698578 707	0.698578 707	0.196764 195
LGBM	0.717942 807	0.678963 526	0.534733 125	0.656139 552	0.666358 974	0.666358 974	0.211226 184	0.652619 418	0.419172 696	0.247159 091	0.443877 551	0.699115 044	0.699115 044	0.197634 474
XGBoost	0.661666 667	0.636111 111	0.291666 667	0.406666 667	0.626388 889	0.626388 889	0.236502 858	0.592592 593	0.386904 762	0 0	0 0	0.666666 667	0.666666 667	0.194124 444
XGBoost simple impute (mean)	0.498333 333	0.662599 206	0.425	0.406666 667	0.406944 444	0.406944 444	0.279911 933	0.576923 077	0.444006 87	0.666666 667	0.363636 364	0.526315 789	0.526315 789	0.274198 685
Logistic Regressio n iterative impute	0.683379 105	0.637123 146	0.500456 877	0.623194 737	0.640974 359	0.640974 359	0.222492 347	0.615738 969	0.387158 681	0.299242 424	0.425302 826	0.687047 466	0.687047 466	0.208590 89
Logistic Regressio n simple impute (mean)	0.677670 546	0.630643 847	0.485670 655	0.618715 916	0.635897 436	0.635897 436	0.223836 825	0.619616 125	0.400185 514	0.301136 364	0.424	0.686242 961	0.686242 961	0.206740 072
Catboost	0.713507 976	0.676675 555	0.524872 579	0.651077 018	0.661487 179	0.661487 179	0.212369 241	0.655486 189	0.427058 909	0.279356 061	0.470494 418	0.706891 928	0.706891 928	0.197094 15
Catboost simple impute (mean)	0.710275 045	0.673040 113	0.522925 14	0.645077 59	0.657692 308	0.657692 308	0.213387 82	0.654418 767	0.422731 262	0.25	0.474820 144	0.709305 444	0.709305 444	0.196742 482

Random Forest	0.692571958	0.646233333	0.496672998	0.634945169	0.646923077	0.646923077	0.219430759	0.6383736	0.389733727	0.196969697	0.457142857	0.706355591	0.706355591	0.202395066
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Renal

Post-HTN Blood Pressure

Model	Sample A AUC	Sample A AUPRC	Sample A Recall	Sample A Precision	Sample A F1	Sample A Accuracy	Sample A Brier	Sample B AUC	Sample B AUPRC	Sample B Recall	Sample B Precision	Sample B F1	Sample B Accuracy	Sample B Brier
LGBM	0.837184752	0.728020878	0.903216723	0.500220956	0.666925543	0.666925543	0.150981226	0.835826416	0.69679153	0.8234375	0.568500539	0.7328125	0.7328125	0.161838976
LGBM simple impute (mean)	0.836718443	0.72525957	0.905547315	0.4991846	0.665682787	0.665682787	0.15149595	0.83444458	0.698385707	0.8390625	0.561715481	0.728125	0.728125	0.161486481
XGBoost	0.835025101	0.724347587	0.903837889	0.497651042	0.663818736	0.663818736	0.15189536	0.835394897	0.698289814	0.809375	0.572375691	0.734895833	0.734895833	0.163086029
XGBoost simple impute (mean)	0.834924999	0.722509532	0.901818097	0.501442201	0.668375778	0.668375778	0.152226219	0.836627197	0.706766262	0.81875	0.5708061	0.734375	0.734375	0.160808547
Logistic Regression iterative impute	0.776063292	0.662335803	0.846048777	0.459036049	0.616280709	0.616280709	0.174078491	0.722521973	0.577921761	0.659375	0.501783591	0.668229167	0.668229167	0.200606012
Logistic Regression	0.769458045	0.654848822	0.845737204	0.451828125	0.606545421	0.606545421	0.176027301	0.727478027	0.575044128	0.69375	0.488448845	0.655729167	0.655729167	0.198533912

n simple impute (mean)														
Catboost	0.810624 165	0.698950 047	0.207705 482	0.885237 178	0.726788 017	0.726788 017	0.272995 878	0.804376 221	0.666482 142	0.04375	0.823529 412	0.678125	0.678125	0.309670 663
Catboost simple impute (mean)	0.790265 799	0.681220 131	0.218269 12	0.873703 374	0.728807 525	0.728807 525	0.269239 463	0.753323 975	0.617138 134	0.064062 5	0.854166 667	0.684375	0.684375	0.305586 936
Random Forest	0.817599 246	0.698403 521	0.922324 69	0.455747 944	0.606959 72	0.606959 72	0.160624 98	0.823119 507	0.686115 936	0.882812 5	0.482905 983	0.645833 333	0.645833 333	0.165545 573

Pre-HTN features only

Model	Sample A AUC	Sample A AUPRC	Sample A Recall	Sample A Precision	Sample A F1	Sample A Accuracy	Sample A Brier	Sample B AUC	Sample B AUPRC	Sample B Recall	Sample B Precision	Sample B F1	Sample B Accuracy	Sample B Brier
LGBM	0.8092763 55	0.6962840 02	0.8827510 23	0.4733220 73	0.6334592 38	0.6334592 38	0.1611903 03	0.7860947 02	0.6481595 63	0.7835703 22	0.5145228 22	0.6814112 69	0.6814112 69	0.1820689 31
LGBM simple impute (mean)	0.8084916 66	0.6966817 26	0.8808624 49	0.4729449 8	0.6329870 95	0.6329870 95	0.1613823 98	0.7833332 09	0.6477063 06	0.7946287 52	0.5045135 41	0.6714060 03	0.6714060 03	0.1809458 69

XGBoost	0.804808205	0.691143628	0.885111741	0.470155191	0.629209946	0.629209946	0.162786932	0.78448747	0.6474429	0.781990521	0.533980583	0.699842022	0.699842022	0.182475597
XGBoost simple impute (mean)	0.805774921	0.691866519	0.880547686	0.469897509	0.629000105	0.629000105	0.162465522	0.786787883	0.657834462	0.793048973	0.520746888	0.687730384	0.687730384	0.180385528
Logistic Regression iterative impute	0.778441657	0.663435501	0.855366698	0.461700532	0.619347393	0.619347393	0.17293626	0.752176875	0.613527459	0.718799368	0.503875969	0.670352817	0.670352817	0.189040238
Logistic Regression simple impute (mean)	0.771830013	0.658888491	0.855366698	0.45260592	0.60696674	0.60696674	0.174455443	0.743942309	0.604693897	0.717219589	0.491341991	0.65824118	0.65824118	0.192411754
Catboost	0.77683032	0.6650095	0.168870003	0.880805396	0.715349911	0.715349911	0.279397397	0.724799034	0.585426509	0.012638231	1	0.67087941	0.67087941	0.317054531
Catboost simple impute (mean)	0.746995057	0.63977583	0.19389361	0.861742591	0.720910712	0.720910712	0.274760448	0.690684047	0.564260952	0.025276461	0.941176471	0.674565561	0.674565561	0.316801949
Random Forest	0.788142123	0.671454684	0.902581051	0.427922405	0.565313189	0.565313189	0.169379063	0.77849342	0.641886318	0.856240126	0.458933108	0.615587151	0.615587151	0.17946872

Appendix D - All Deep Learning Results

Cohort	BP	Sample A AUC	Sample A AUPRC	Sample A F1	Sample B AUC	Sample B AUPRC	Sample B F1
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All3	Post-HTN BP	0.9404066245960212	0.9635024685654429	0.8715213358070499	0.9437269172514658	0.9502540509235957	0.9192447679708826
All3	Pre-HTN only	0.6919300535716864	0.6992510517561582	0.6352361535847775	0.6161146006244977	0.43645449017162663	0.6163803833706746
Cerebro	Post-HTN BP	0.6820019377279611	0.5028480384160077	0.6618705035971223	0.7397626287307016	0.5883550546239906	0.6828385228095583
Cerebro	Pre-HTN only	0.6404607970255117	0.4413056880209929	0.6643816052556413	0.6455333778590433	0.47099603215290453	0.6747839748625295
Cardiac	Post-HTN BP	0.8227378604523815	0.7624478968295003	0.7725340136054422	0.8630436513039059	0.7423353343331638	0.8205938092229943
Cardiac	Pre-HTN only	0.663232227388711	0.5974260529619166	0.631408276714021	0.6169152389608206	0.3698767193638195	0.6734553775743707
Renal	Post-HTN BP	0.7779791515374747	0.6465207851546423	0.710590531966813	0.7723284351438683	0.672428567389906	0.7277882797731569
Renal	Pre-HTN only	0.7434747909365349	0.6270728885871386	0.727686384319216	0.7025905536543834	0.5812986207628607	0.7105398457583547

Appendix E - Model parameters

Machine Learning Parameters

XGBoost	LGBM	CatBoost
Colsample bytree: 0.20 Minimum child weight: 0.5	Boost from average: False Is unbalance: True	Objective: Logloss Evaluation metric: AUC Iterations: 1200

Minimum split loss: 0.5 Subsample: 0.5 N-jobs: -1 Maximum depth: 15 Reg alpha: 1 Reg lambda: 1 Random state: 42 Learning rate: 0.05 Maximum bin: 32	Boosting: gbd Learning rate: 0.05 Number of leaves: 250 Device: cpu Maximum depth: 15 Maximum bin: 32 Lambda l1: 2 Lambda l2: 2 Subsample for bin: 200 Subsample: 1 Colsample bytree: 0.2 Minimum split gain: 0.5 Minimum child weight: 1 Minimum child samples: 5 Feature fraction: 0.5 Metric : AUC Reg alpha: 1 Reg lambda: 1 Bagging fraction: 0.8 Bagging freq:10	Verbose: 50 Maximum leaves: 45 L2 leaf reg: 2 Boosting type: Plain Boost from average: False Grow policy: Lossguide Minimum data in leaf: 15 Custom metric: Logloss, AUC Maximum depth: 5 Random state: 42 Learning rate: 0.01 Maximum bin: 32 Maximum leaves: 45
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Deep Learning Parameters

Deep Learning Model Summary

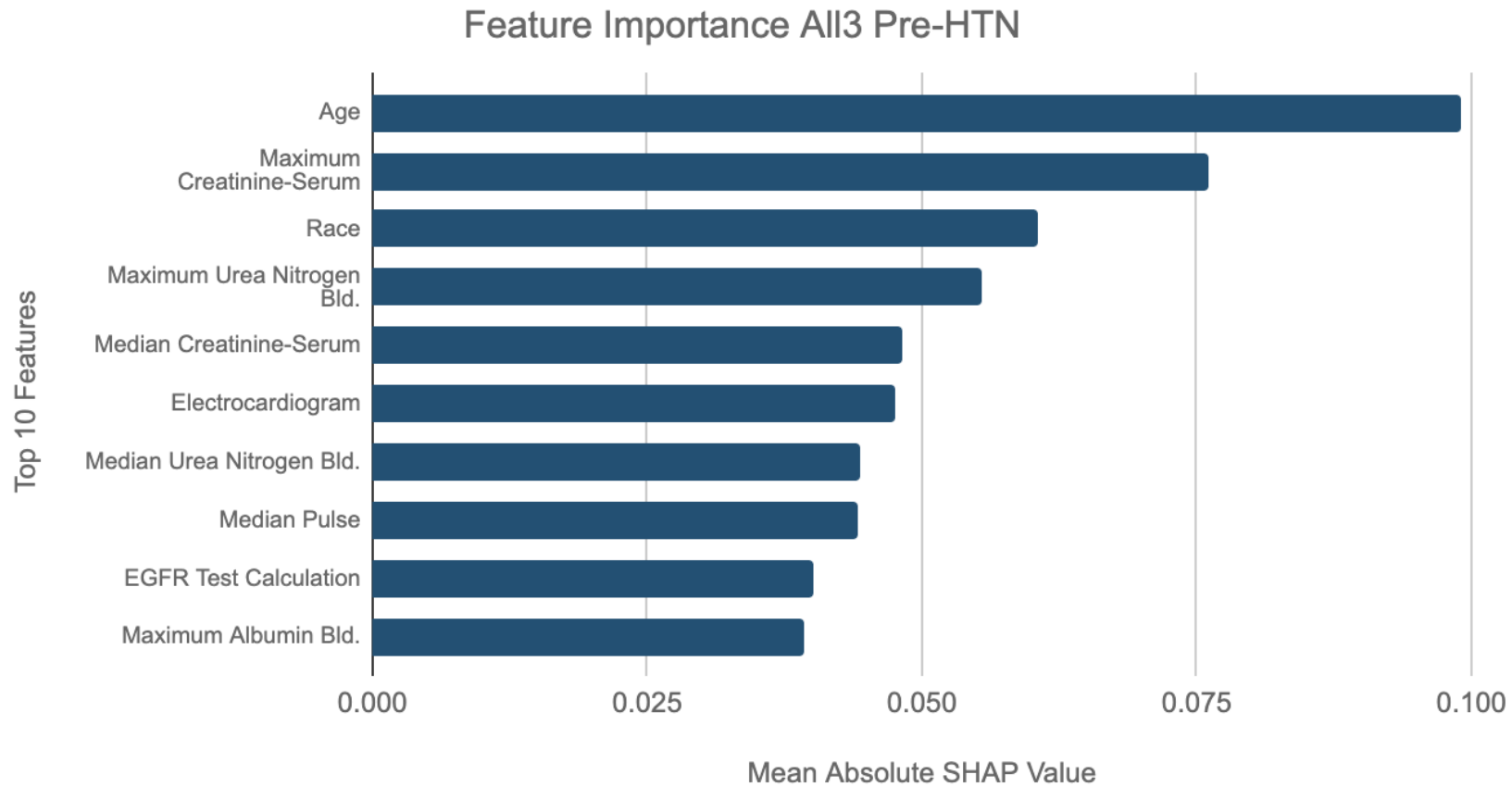
Layer (type)	Output Shape	Param #	Connected to
main_input (InputLayer)	[(None, 150)]	0	
Embedding_1 (Embedding)	(None, 150, 100)	52400	main_input[0][0]
lstm_1 (LSTM)	(None, 100)	80400	Embedding_1[0][0]
aux_input (InputLayer)	[(None, 0)]	0	
concatenate_1 (Concatenate)	(None, 100)	0	lstm_1[0][0] aux_input[0][0]
dropout (Dropout)	(None, 100)	0	concatenate_1[0][0]
dense_1 (Dense)	(None, 100)	10100	dropout[0][0]
dropout_1 (Dropout)	(None, 100)	0	dense_1[0][0]
main_output (Dense)	(None, 1)	101	dropout_1[0][0]

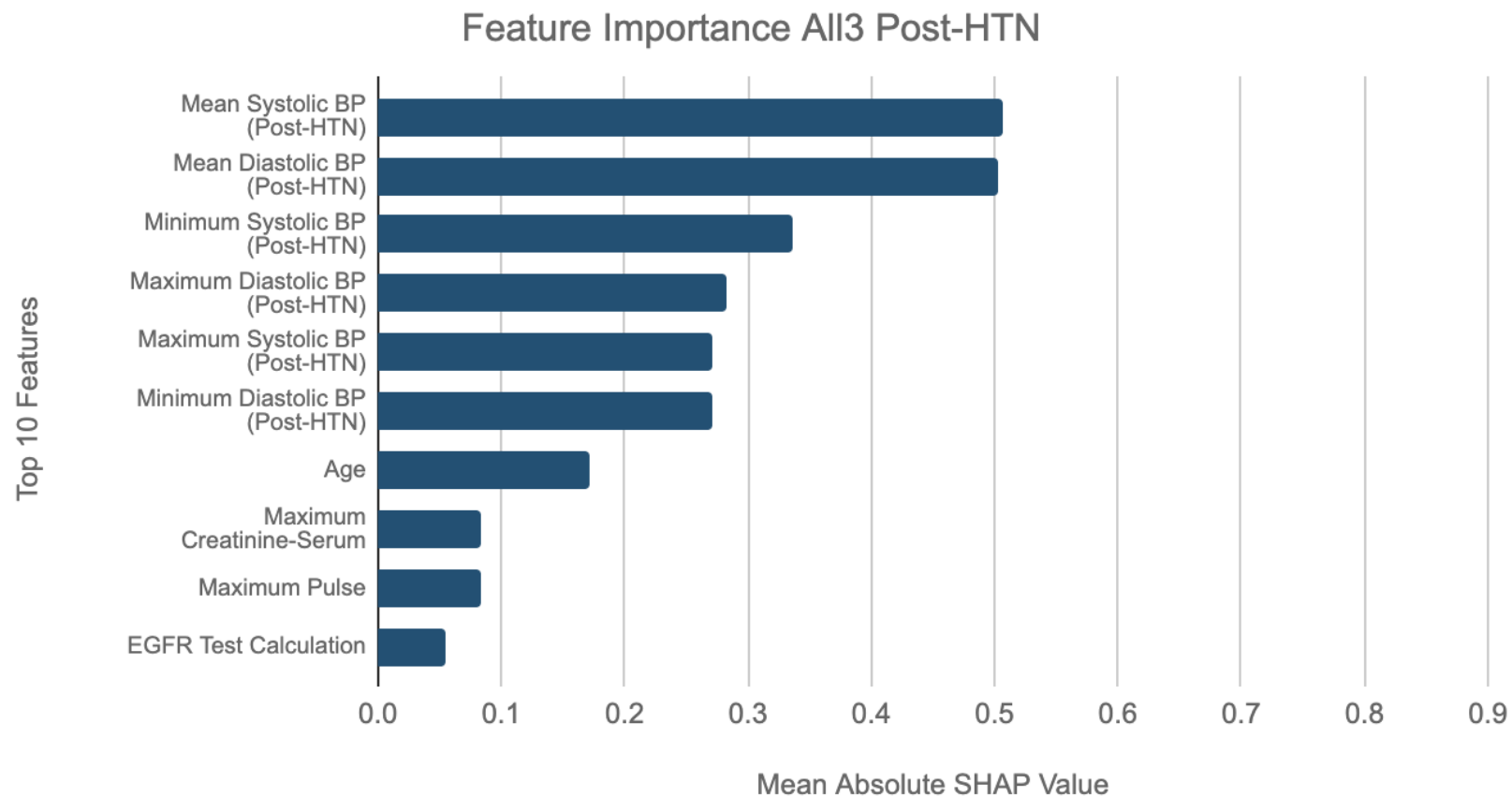
Dropout rate = 0.5

Learning rate = 0.001

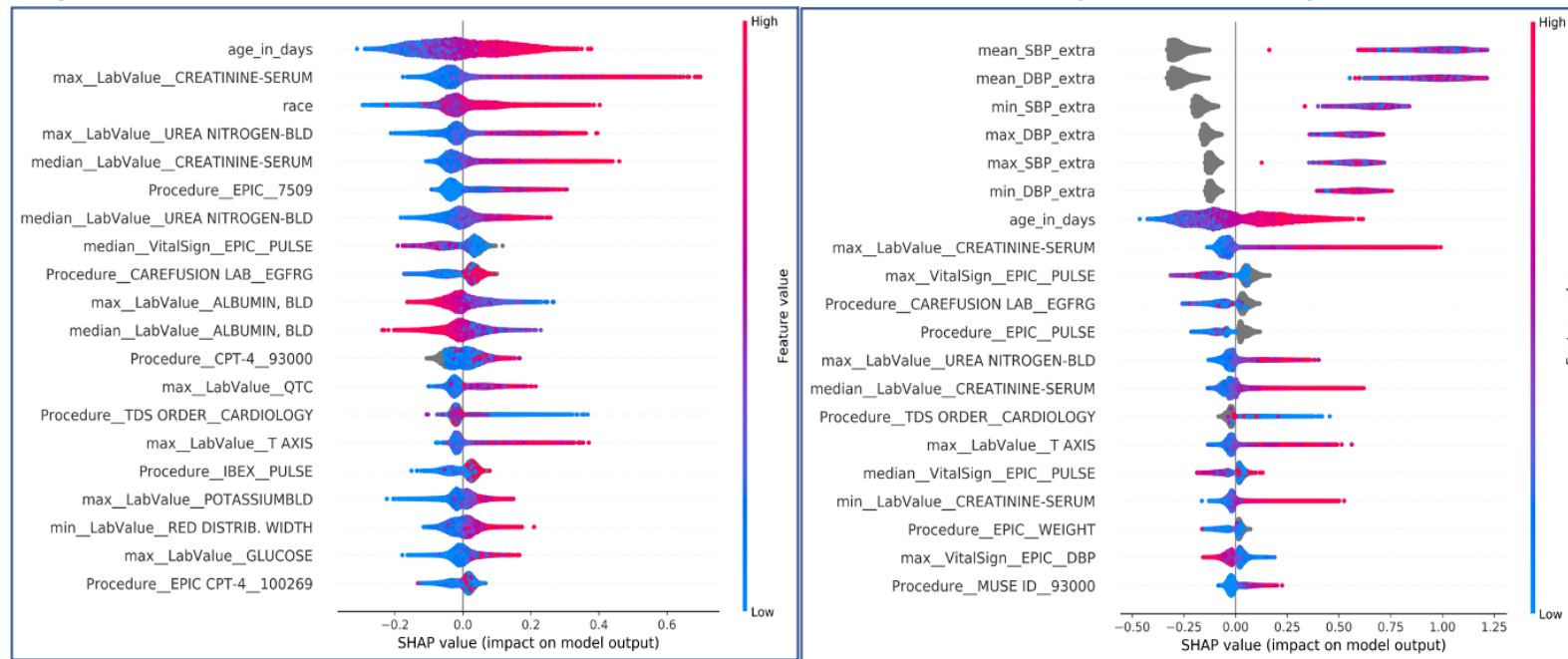
Appendix F - SHAP Feature Importance Plots

All3 Cohort

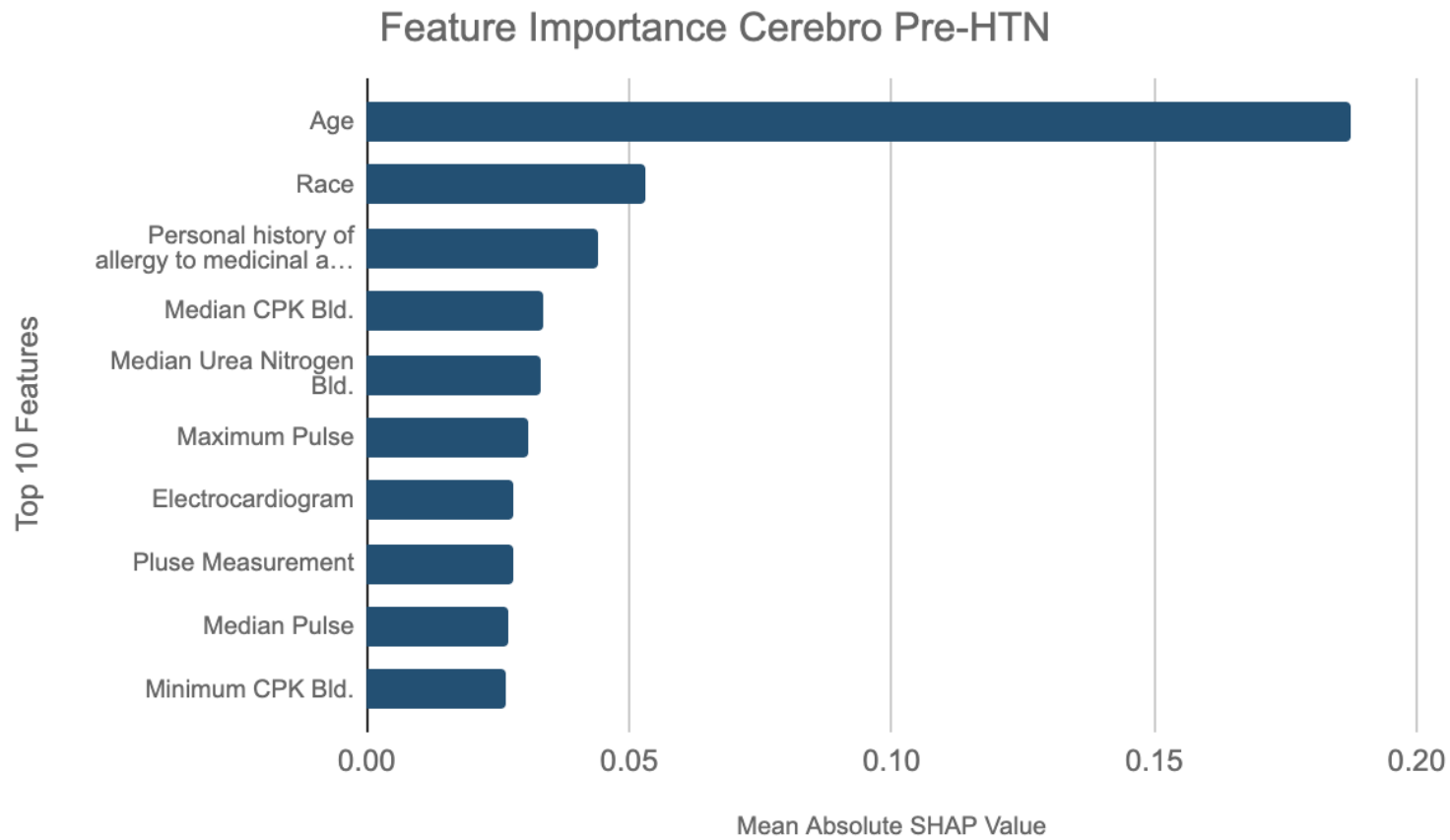




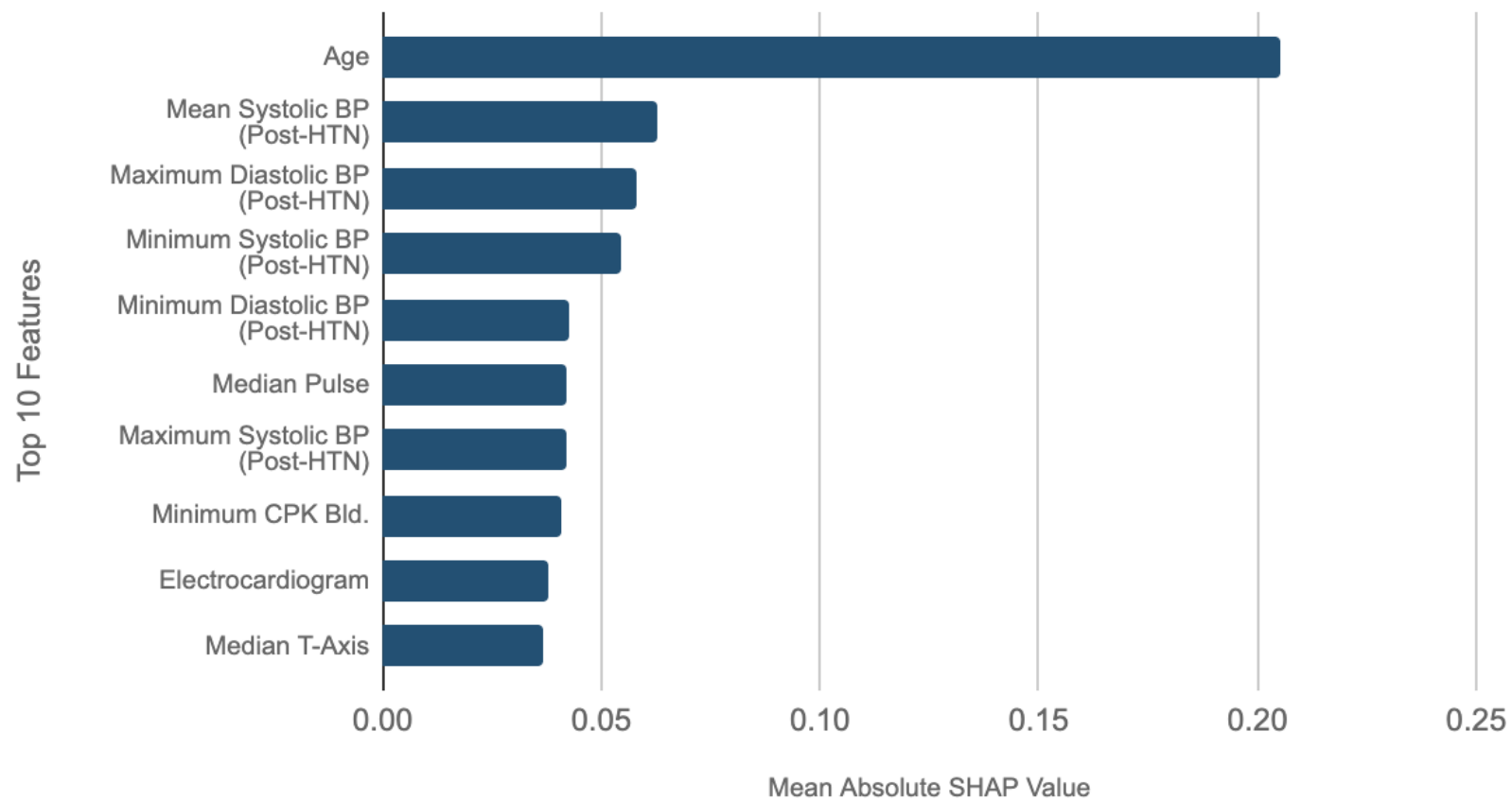
Original SHAP Plot - All3 Pre-HTN and with Post-HTN blood pressure values (Top 20 Features)



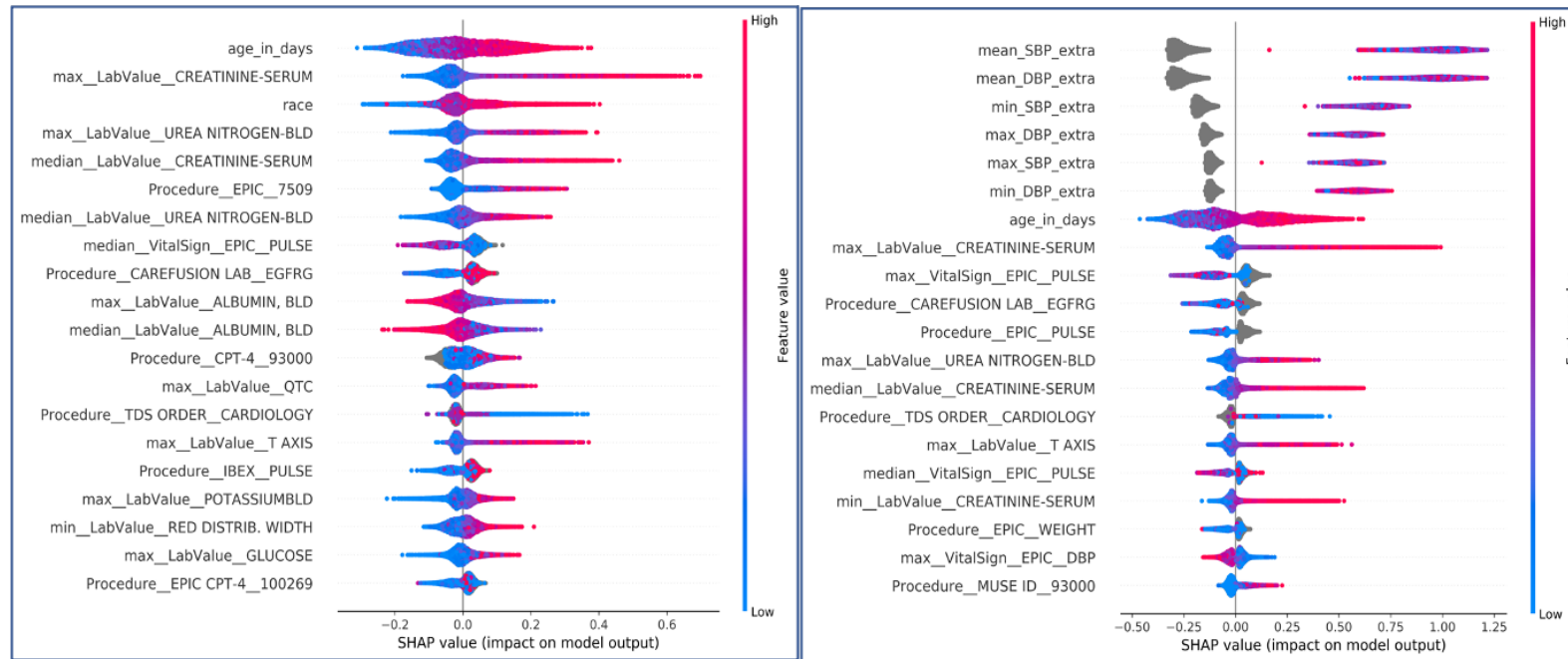
Cerebro Cohort



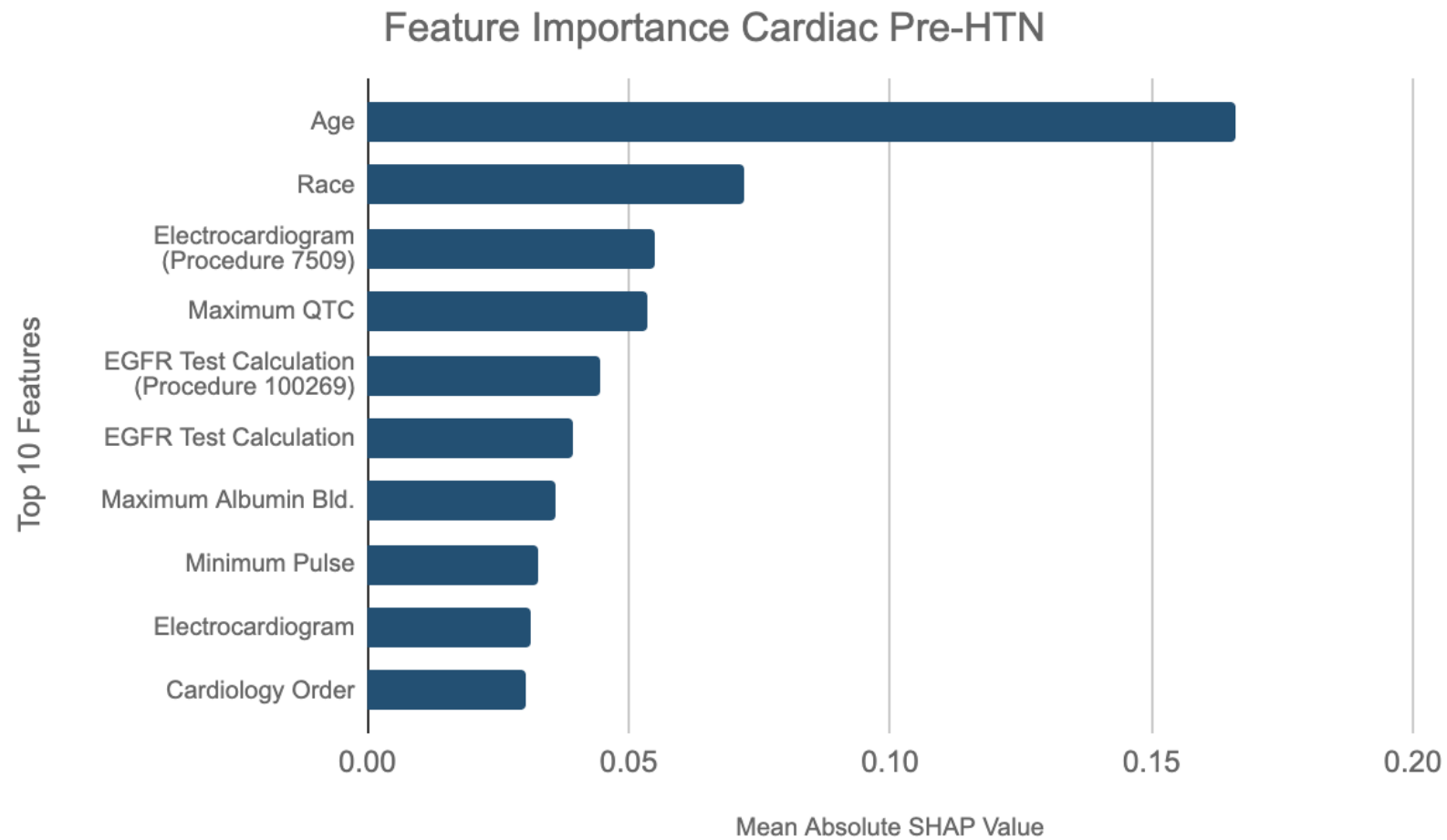
Feature Importance Cerebro Post-HTN



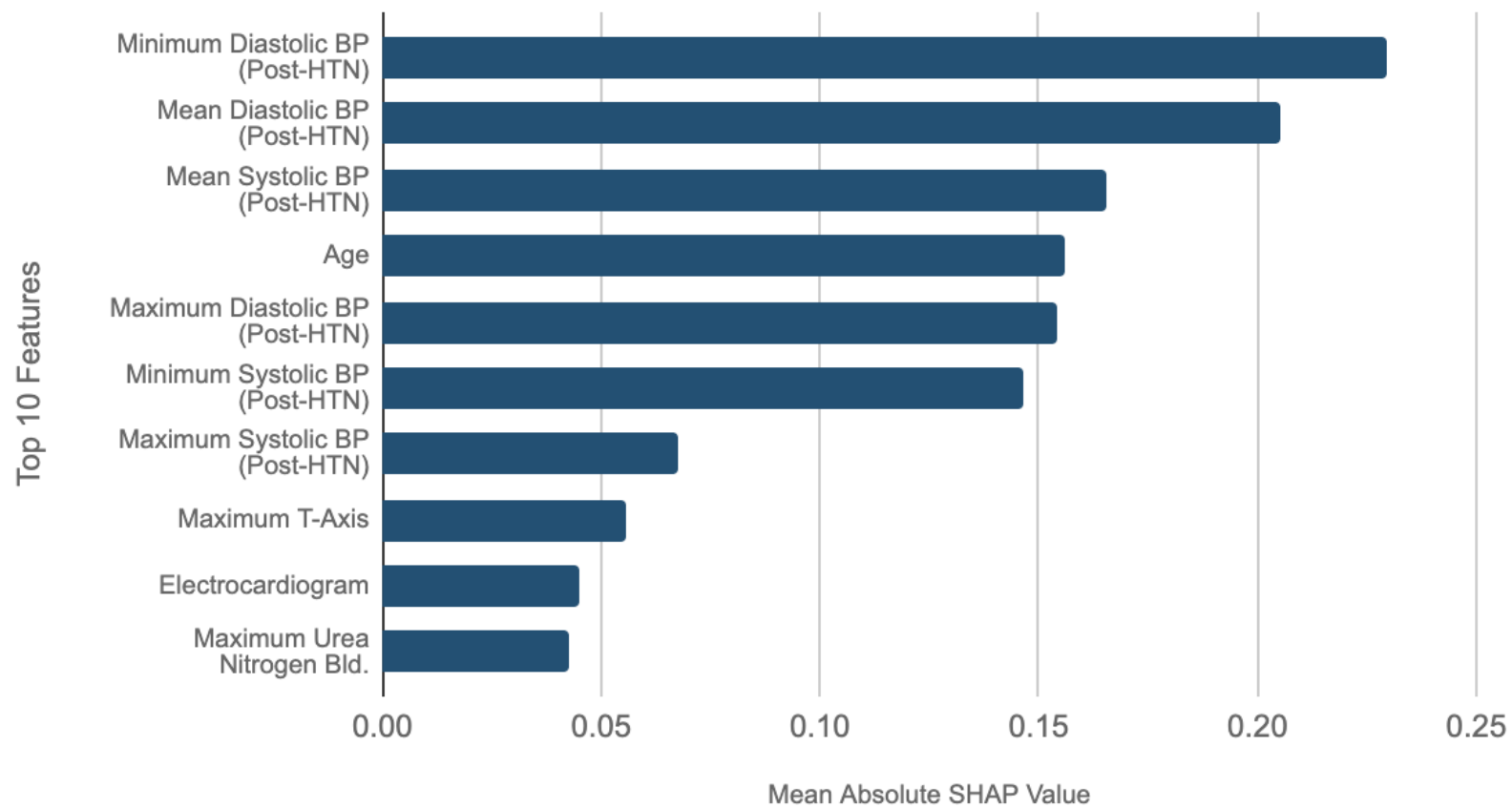
Original SHAP Plot - Cerebro Pre-HTN and with Post-HTN blood pressure values (Top 20 Features)



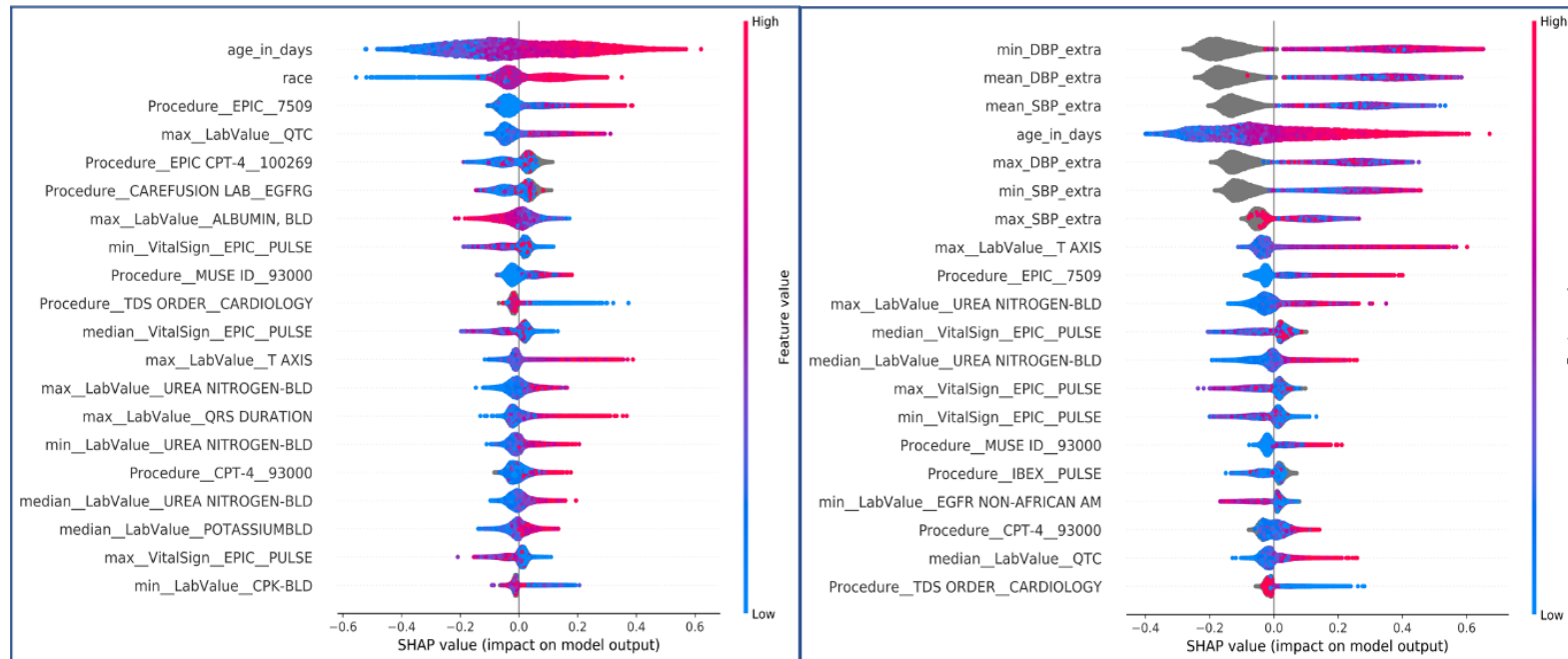
Cardiac Cohort



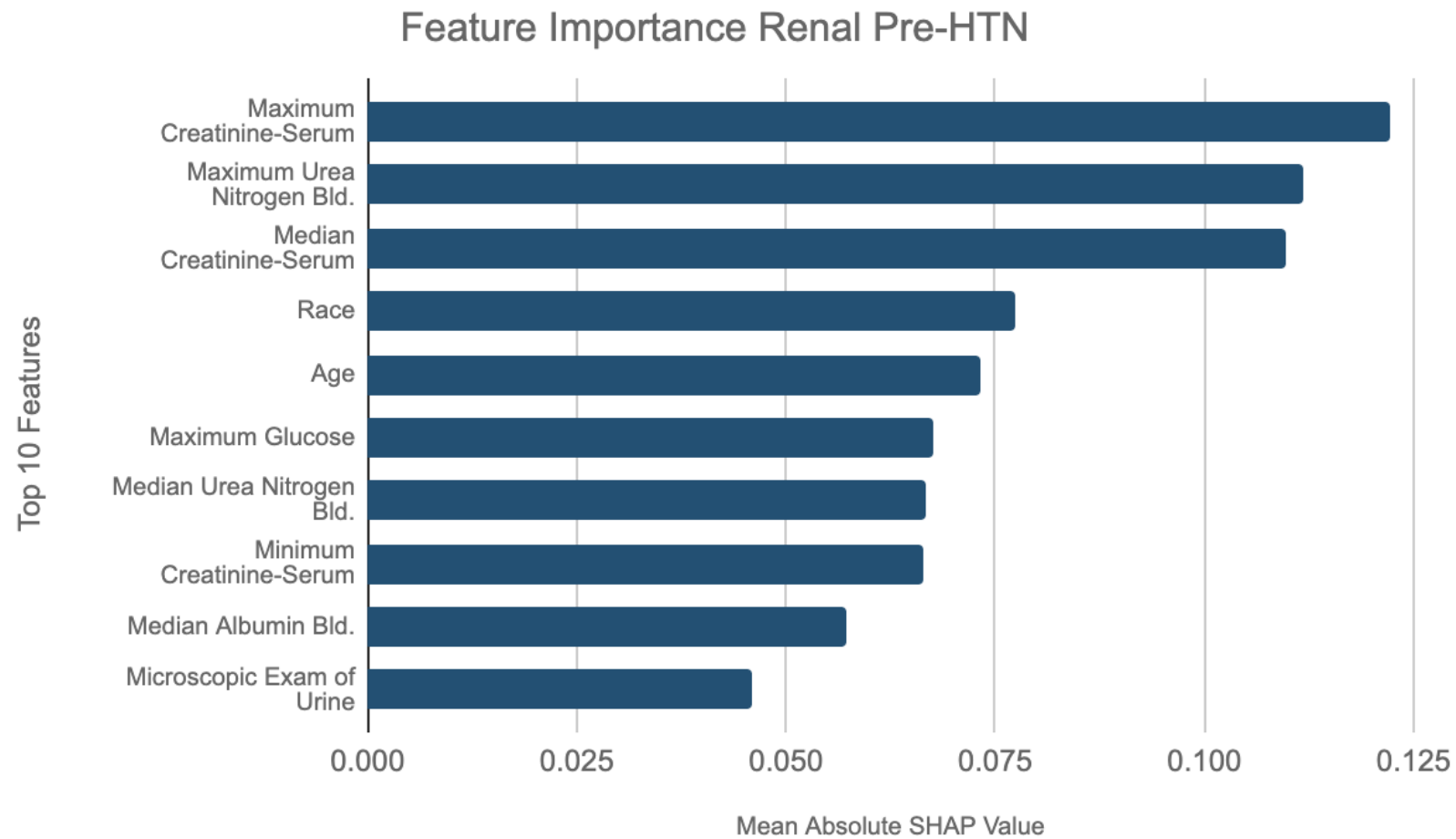
Feature Importance Cardiac Post-HTN



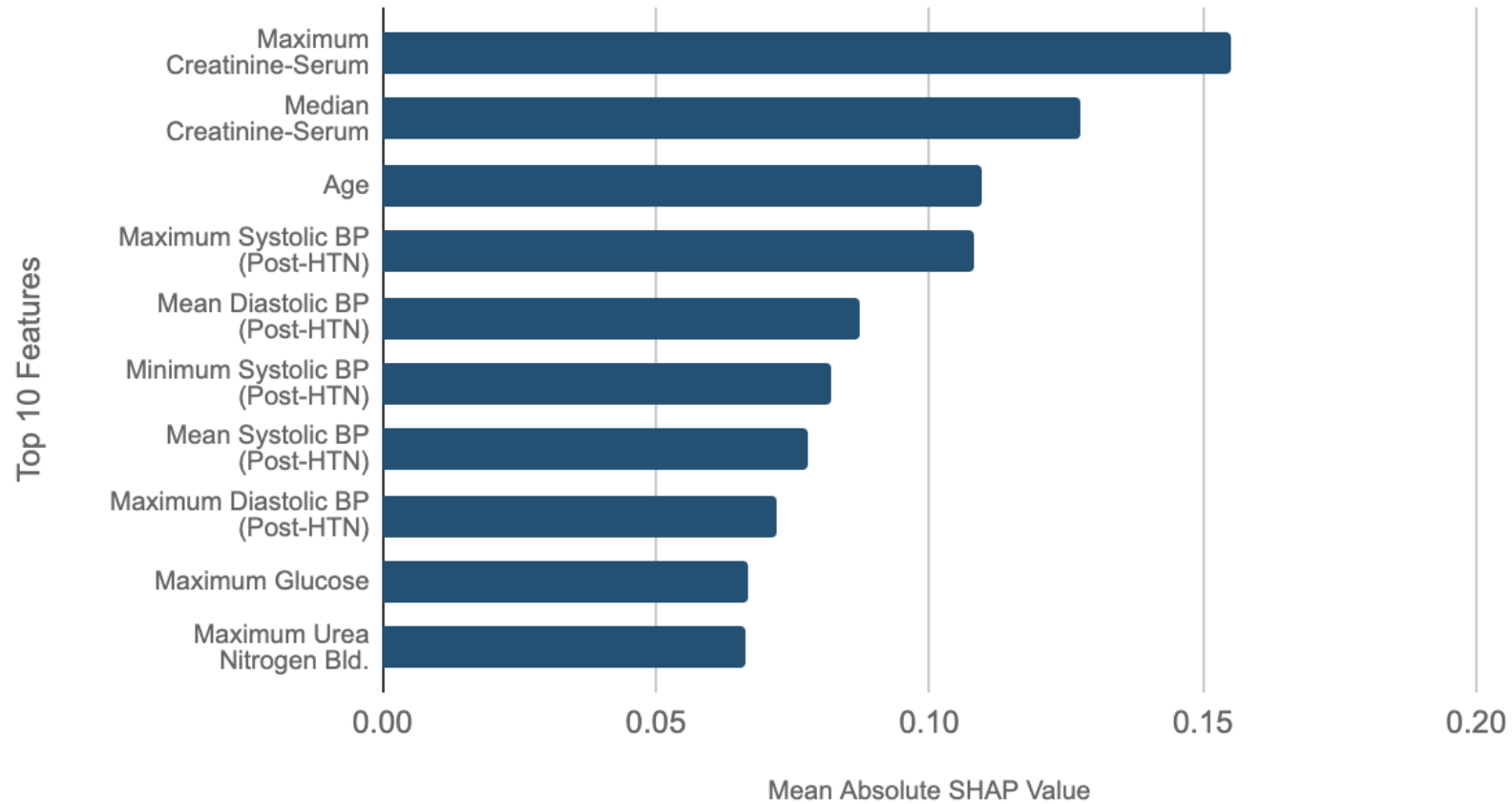
Original SHAP Plot - Cardiac Pre-HTN and with Post-HTN blood pressure values (Top 20 Features)



Renal Cohort



Feature Importance Renal Post-HTN



Original SHAP Plot - Renal Pre-HTN and with Post-HTN blood pressure values (Top 20 Features)

