

Figure S1-1

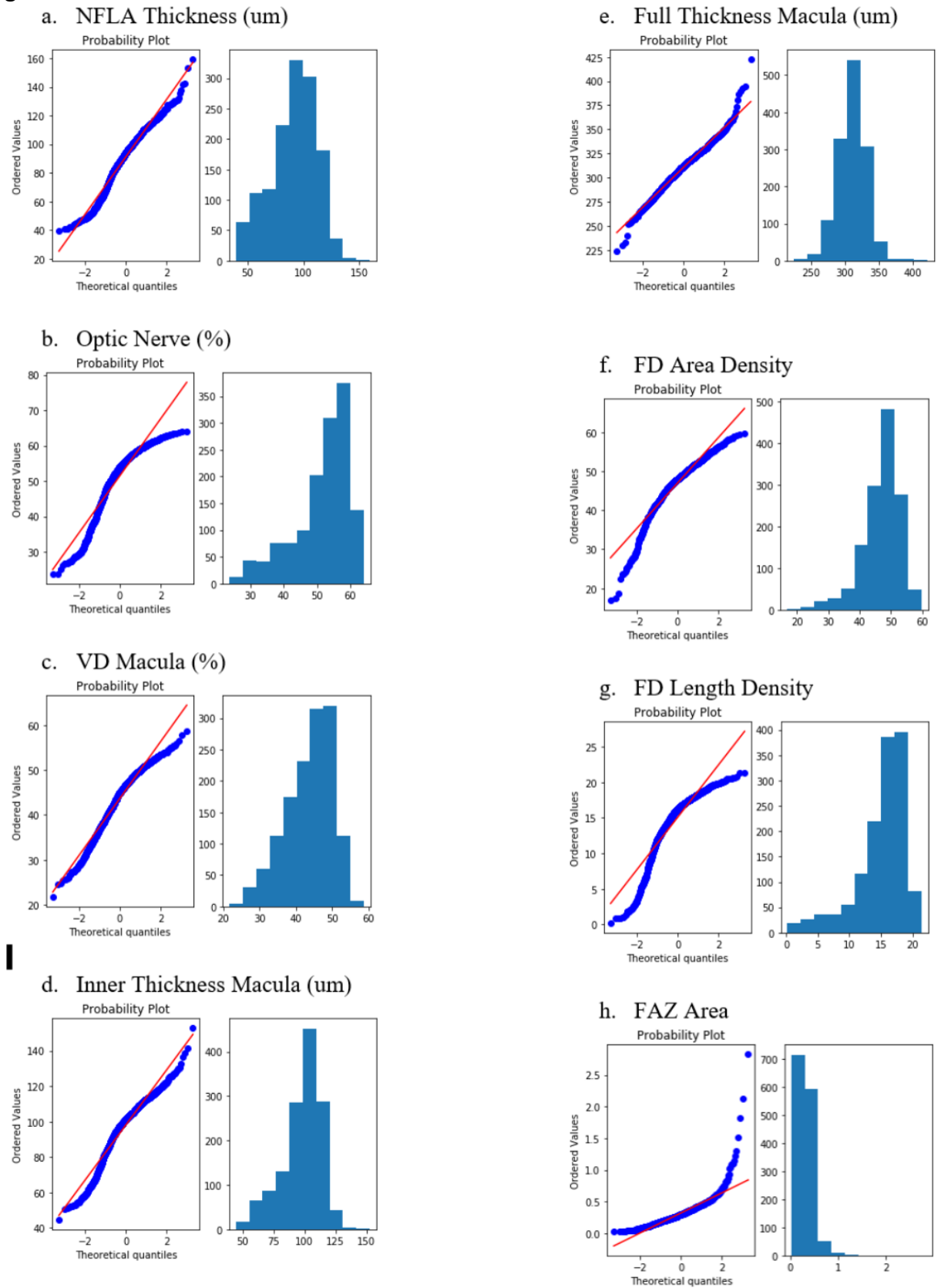


Figure S1-2

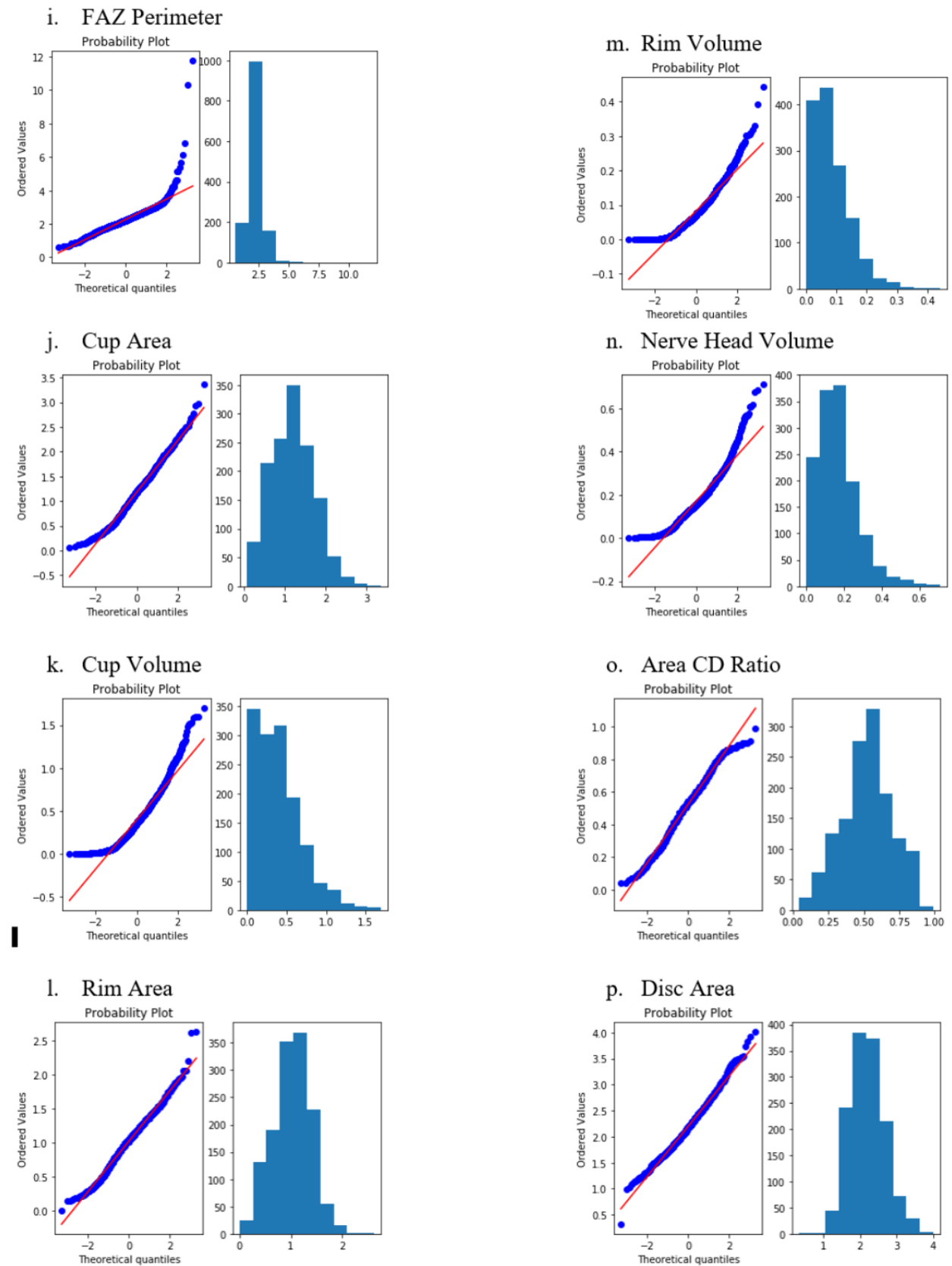
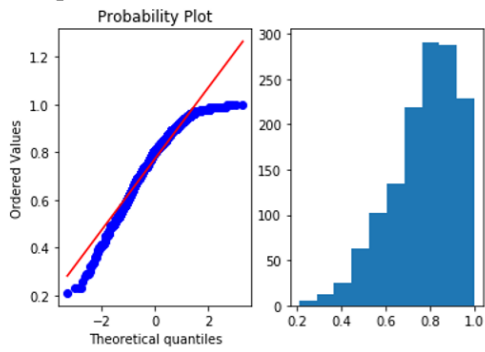
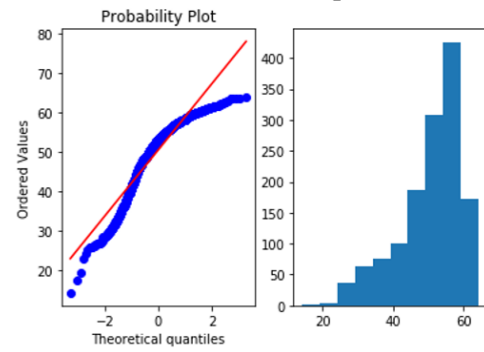


Figure S1-3

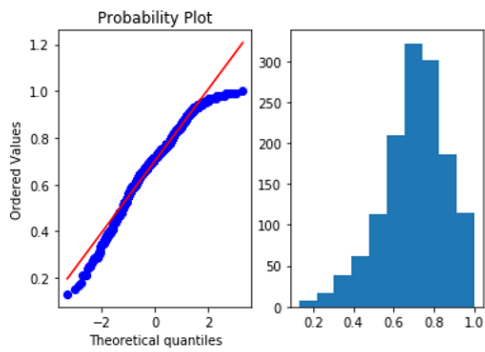
q. HCD Ratio



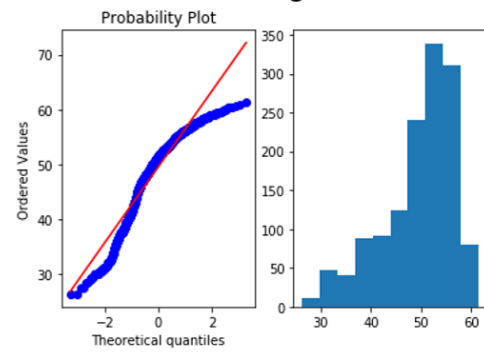
u. VD Inferior Hemisphere



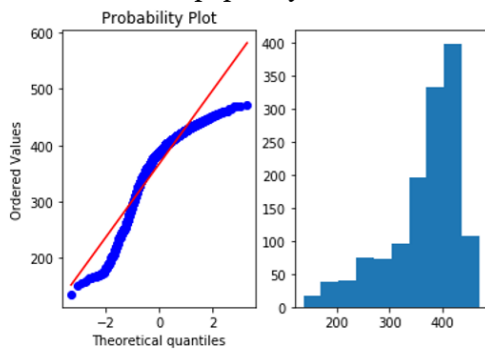
r. VCD Ratio



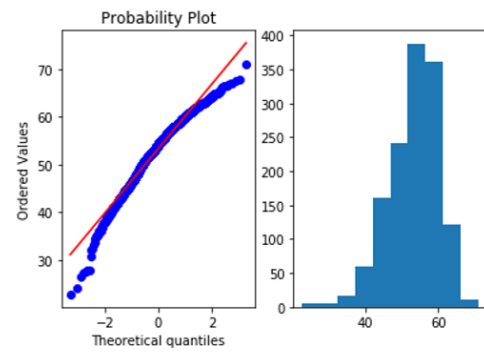
v. VD Whole Image



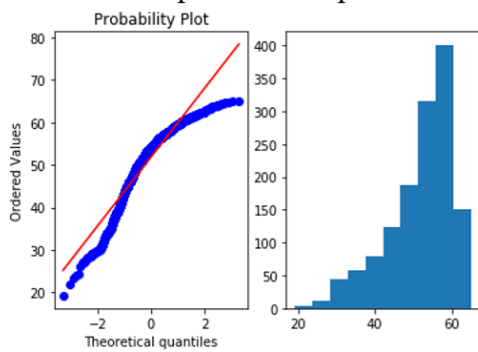
s. VD Peripapillary 8 Sectors



w. VD Inside Disc



t. VD Superior Hemisphere



x. RNFL Thickness 8 Sectors

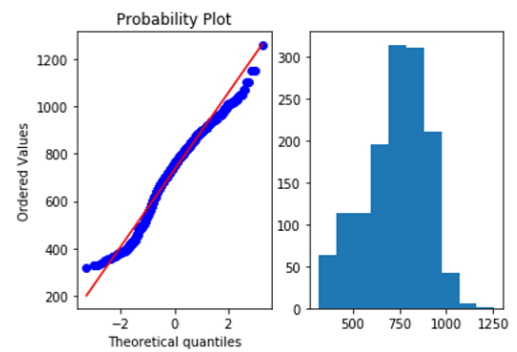
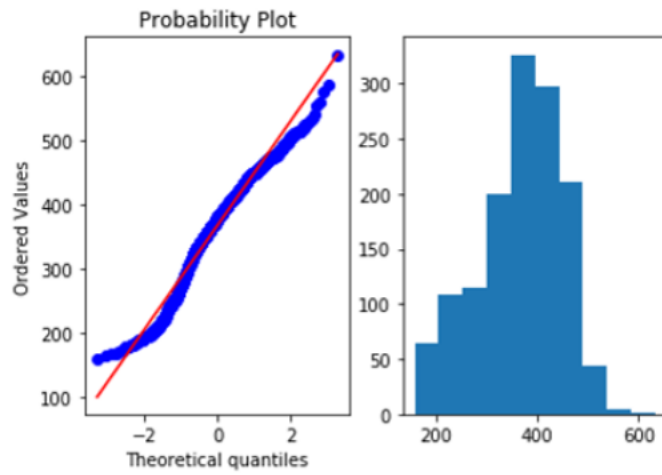
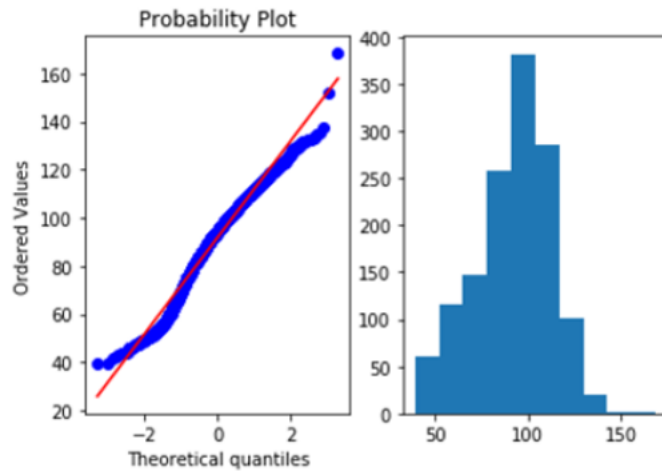


Figure S1-4

y. RNFL Thickness 4 Sectors



z. RNFL Superior Hemisphere



aa. RNFL Inferior Hemisphere

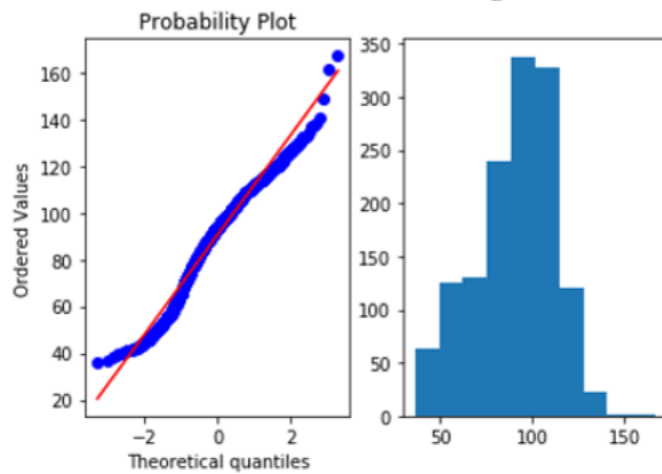


Figure S2

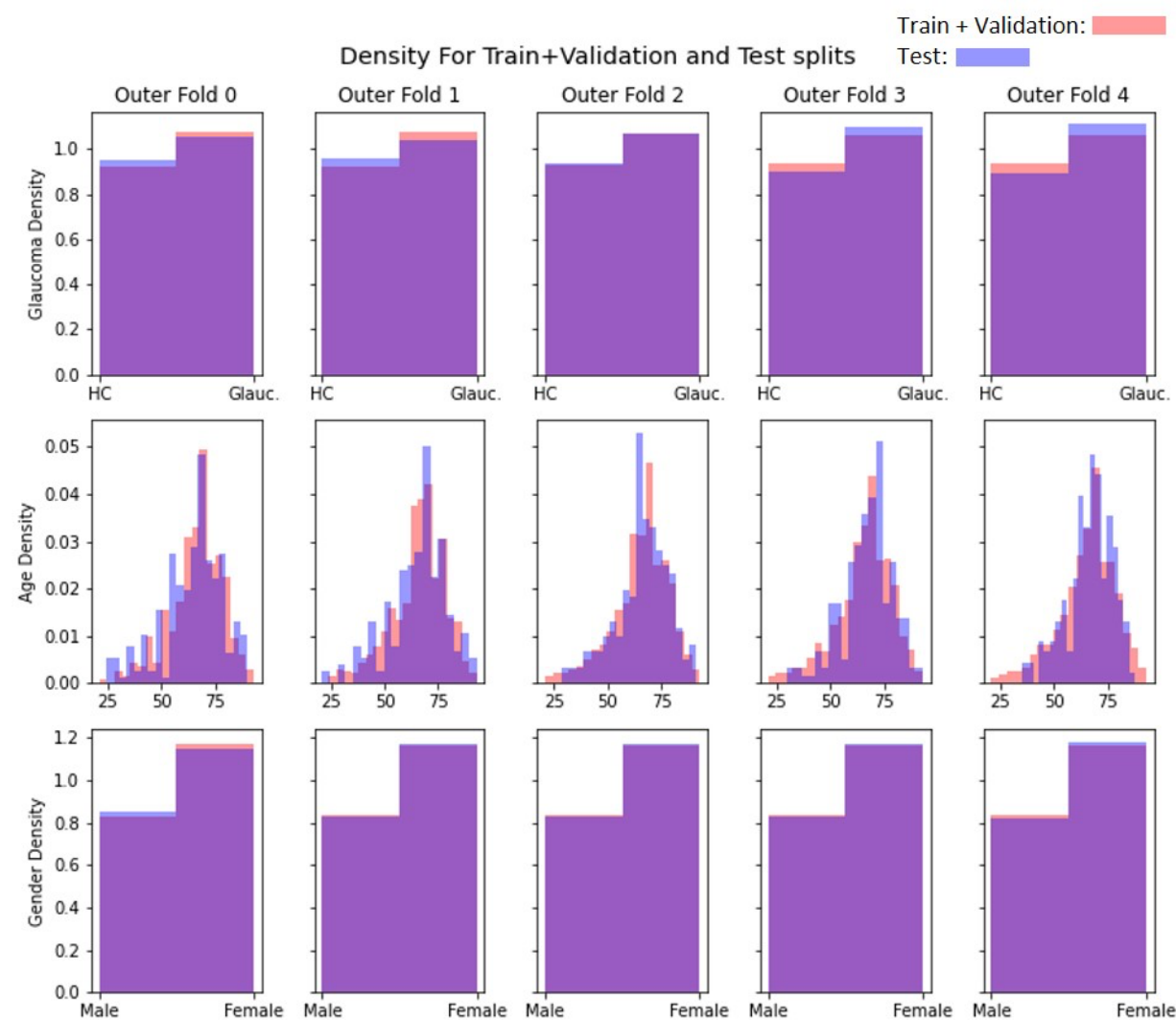
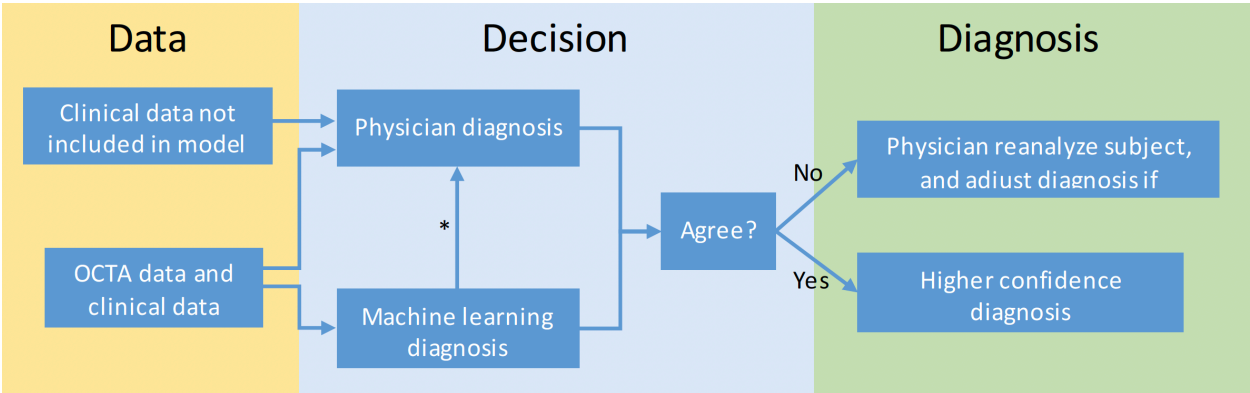


Figure S3



*Additional knowledge gained by feature importance and decision trees

Figure S4

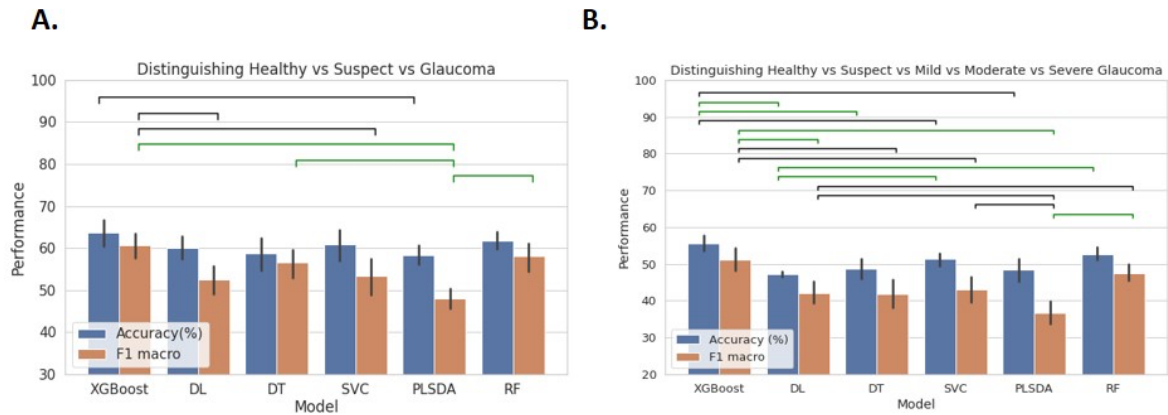
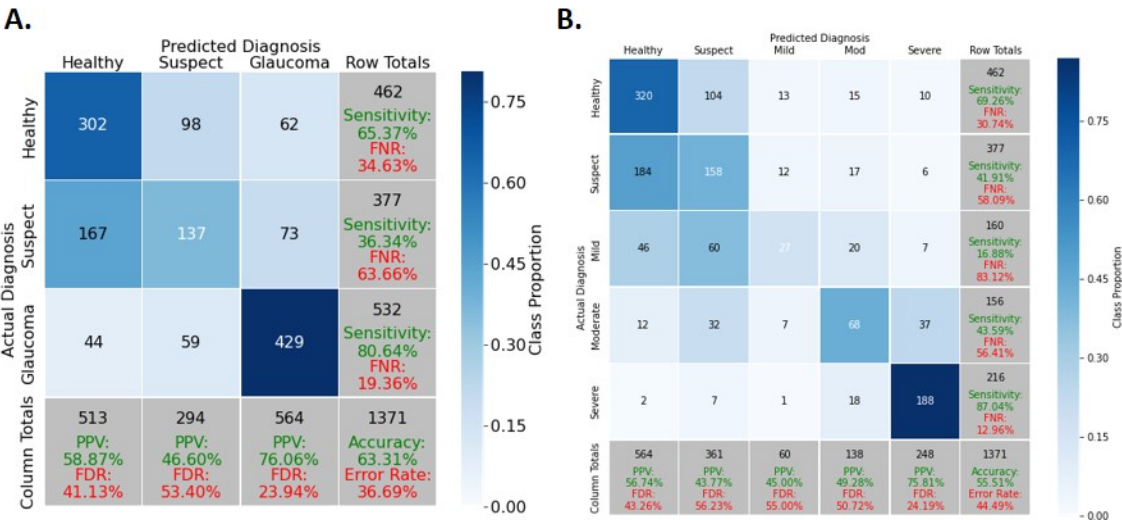


Figure S5



Supplementary Table 1: Definitions of disease history

History of Myopia	Pre-correction refractive error <-0.5D
History of Hypertension	Diagnosed in chart – systolic blood pressure > 130 mmHg and/or diastolic blood pressure >90 mmHg
History of Diabetes	Diagnosed in chart – A1c > 6.4%
Family History of Glaucoma	At least one immediate family member with clinically diagnosed glaucoma

Supplementary Table 2: Comprehensive list of included demographic, clinical, and OCTA features

Demographic Features	
Age	Race
Sex	
Clinical Features	
History of myopia	Family history of glaucoma
History of hypertension	Central corneal thickness
History of diabetes	Intraocular pressure
OCTA Features	
Foveal avascular zone (FAZ)	
FAZ area	Flow density area density
FAZ perimeter	Flow density length density
Structural	
Cup area	Vertical cup to disc ratio
Cup volume	Rim area
Cup to disc ratio	Rim volume
Horizontal cup to disc ratio	Optic nerve head volume
Optic nerve head vessel density	
Vessel density whole image	Inferior temporal vessel density
Vessel density inside disc	Inferior nasal vessel density
Vessel density peripapillary	Nasal inferior vessel density
Vessel density superior hemisphere	Nasal superior vessel density
Vessel density inferior hemisphere	Superior nasal vessel density
Temporal superior vessel density	Superior temporal vessel density
Temporal inferior vessel density	
Retina vessel density	
Retinal vessel density superior	Retinal vessel density temporal
Retinal vessel density inferior	Retinal vessel density nasal
Retinal nerve fiber layer (RNFL) thickness	
RNFL thickness nasal superior	RNFL thickness peripapillary
RNFL thickness superior nasal	RNFL thickness superior hemisphere
RNFL thickness temporal inferior	RNFL thickness inferior hemisphere
RNFL thickness inferior temporal	Average retinal full thickness
RNFL thickness inferior nasal	Retina full thickness inferior
RNFL thickness nasal inferior	Retina full thickness superior
RNFL thickness superior temporal	Retinal full thickness temporal
RNFL thickness temporal superior	Retina full thickness nasal
RNFL thickness superior	Retina inner thickness inferior
RNFL thickness nasal	Retina inner thickness superior
RNFL thickness inferior	Retina inner thickness temporal
RNFL thickness temporal	Retina inner thickness nasal

Supplementary Table 3: Dimensions of the hyperparameter search spaces of each machine learning algorithm

Support Vector Classifier (SVC)	
L2 regularization weight	$1/(2^N)$ where $-20 \leq N \leq 20$, step 0.5
Kernel	Linear or RBF
Kernel coefficient	2^N where $-30 \leq N \leq 0$, step 0.5
XGBoost	
Learning rate	10^{-N} where $1 \leq N \leq 10$
Max depth	$1 \leq N \leq 20$
Booster	gbtree, gblinear, dart
Tree method	auto, exact, approx, hist
Minimum loss required for leaf partition	$0.1 \leq N \leq 1$, step 0.01
Minimum child weight	$0 \leq N \leq 2$, step 0.01
Maximum delta step	$0 \leq N \leq 2$, step 0.01
Subsample ratio	$0 \leq N \leq 1$, step 0.01
Alpha (L1 regularization weight)	10^N where $-5 \leq N \leq 3$
Lambda (L2 regularization weight)	10^N where $-5 \leq N \leq 3$
Deep Feed Forward Neural Network (DL)	
Number of layers	$1 \leq N \leq 9$
Number of neurons per layer	$5 \leq N \leq 500$
Learning rate	10^{-N} where $1 \leq N \leq 10$
Activation	PReLU or ReLU
Inclusion of batch normalization	True or false
Drop out rate per layer	0, 0.2 or 0.5
Random Forest (RF)	
Maximum depth	$2 \leq N \leq 13$
Selection criterion	gini or entropy
Minimum samples per split	2, 5 or 10
Minimum samples per leaf	1, 2, or 4
Maximum features	$10 \leq N \leq 64$
Number of estimators	10, 30, 50, 100, 200, 400, 600, 700, 1000 or 1200
Decision Tree (DT)	
Hyperparameter	Value options
Maximum depth	$2 \leq N \leq 13$
Selection criterion	gini or entropy
Minimum samples per split	2, 5, or 10
Minimum samples per leaf	1,2 or 4
Maximum features	$10 \leq N \leq 64$
Partial Least-Squares Discriminant Analysis (PLDSA)	
Number of components	$1 \leq N \leq 50$

Supplementary Table 4: Additional OCTA parameters compared across varying severities of glaucoma

Variables median [Q1,Q3]	Overall (n=1371)	Normal (n=462)	Suspect (OHT) ^a (n=377)	Mild (n=160)	Moderate (n=156)	Severe (n=216)	P-Value (Bonferroni adjusted)
RNFL^b							
Thickness	379.2	421.0	399.5	365.0	314.4	235.6	<0.001
4 Sectors (um)	[319.2,427.1]	[387.1,457.4]	[368.1,435.8]	[340.8,394.2]	[283.5,344.6]	[203.1,263.3]	
RNFL^b							
Superior	94.5	105.6	99.5	91.8	80.3	59.3	<0.001
Hemisphere (um)	[79.5,106.3]	[95.8,113.5]	[91.2,108.1]	[84.5,97.6]	[71.5,87.7]	[51.5,67.6]	
RNFL^b							
Inferior	93.8	104.3	99.9	91.1	75.6	55.9	<0.001
Hemisphere (um)	[77.2,106.7]	[94.7,113.5]	[90.6,108.8]	[82.6,99.6]	[66.5,85.3]	[48.9,64.8]	
Inner							
Thickness	101.4	107.0	103.4	101.1	92.9	72.6	<0.001
Macula (um)	[90.5,109.4]	[100.6,112.5]	[97.5,111.5]	[94.9,106.7]	[84.3,100.1]	[63.7,82.9]	
VD^c							
Superior	54.2	57.3	55.8	52.8	48.6	38.0	<0.001
Hemisphere (%)	[47.5,57.9]	[54.3,60.2]	[52.7,58.6]	[49.4,56.0]	[44.8,51.9]	[33.0,43.0]	
VD^c							
Inferior	53.0	56.7	54.9	52.0	46.4	35.9	<0.001
Hemisphere (%)	[46.6,57.1]	[53.2,59.0]	[51.8,57.6]	[48.4,55.1]	[41.6,50.0]	[30.9,40.9]	
VD^c							
Whole	51.3	54.5	52.7	50.4	46.2	37.8	<0.001
Image (%)	[46.1,54.9]	[51.6,56.7]	[50.1,55.5]	[47.3,52.8]	[41.8,48.5]	[33.4,41.2]	
Cup Area (mm ²)	1.2 [0.8,1.5]	1.1 [0.7,1.4]	1.1 [0.8,1.4]	1.0 [0.7,1.4]	1.3 [0.9,1.6]	1.5 [1.3,1.9]	<0.001
Cup							
Volume (mm ³)	0.4 [0.2,0.6]	0.3 [0.1,0.5]	0.3 [0.2,0.5]	0.3 [0.1,0.5]	0.4 [0.2,0.6]	0.5 [0.4,0.7]	<0.001
Rim							
Volume (mm ³)	0.1 [0.0,0.1]	0.1 [0.1,0.1]	0.1 [0.1,0.1]	0.1 [0.1,0.1]	0.0 [0.0,0.1]	0.0 [0.0,0.0]	<0.001
Nerve							
Head							
Volume (mm ³)	0.2 [0.1,0.2]	0.2 [0.1,0.3]	0.2 [0.1,0.2]	0.2 [0.1,0.2]	0.1 [0.1,0.1]	0.0 [0.0,0.1]	<0.001
Disc Area (mm ²)	2.2 [1.9,2.5]	2.2 [1.9,2.6]	2.3 [1.9,2.5]	2.0 [1.8,2.4]	2.1 [1.7,2.4]	2.1 [1.8,2.4]	<0.001
FD^d Area							
Density (%)	48.0	49.0	49.1	47.7	46.7	44.1	<0.001
	[44.3,51.0]	[46.0,51.7]	[46.2,51.9]	[43.0,50.7]	[42.6,49.1]	[40.0,48.2]	
FD^d							
Length	16.2	17.0	16.9	15.7	15.0	13.9	<0.001
Density (%)	[13.5,17.7]	[15.3,18.2]	[14.4,18.0]	[12.6,17.7]	[12.5,16.6]	[11.1,16.0]	

FAZ^e

Perimeter	2.2 [1.9,2.6]	2.2 [1.8,2.5]	2.3 [2.0,2.6]	2.2 [1.9,2.5]	2.2 [1.8,2.6]	2.3 [2.0,2.7]	0.005
(mm)							

Abbreviations: ^a OHT: ocular hypertension, ^b RNFL: retinal nerve fiber layer, ^c VD: vessel density, ^d FD: flow density, ^e FAZ: foveal avascular zone