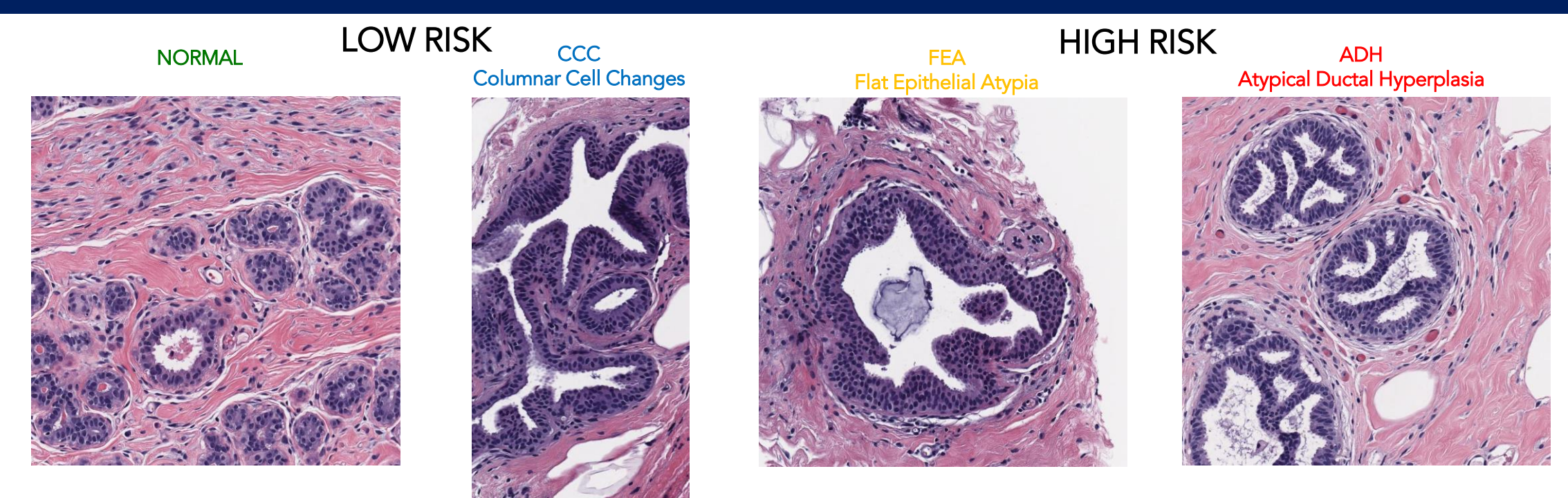


How to diagnose preinvasive atypical breast lesions?

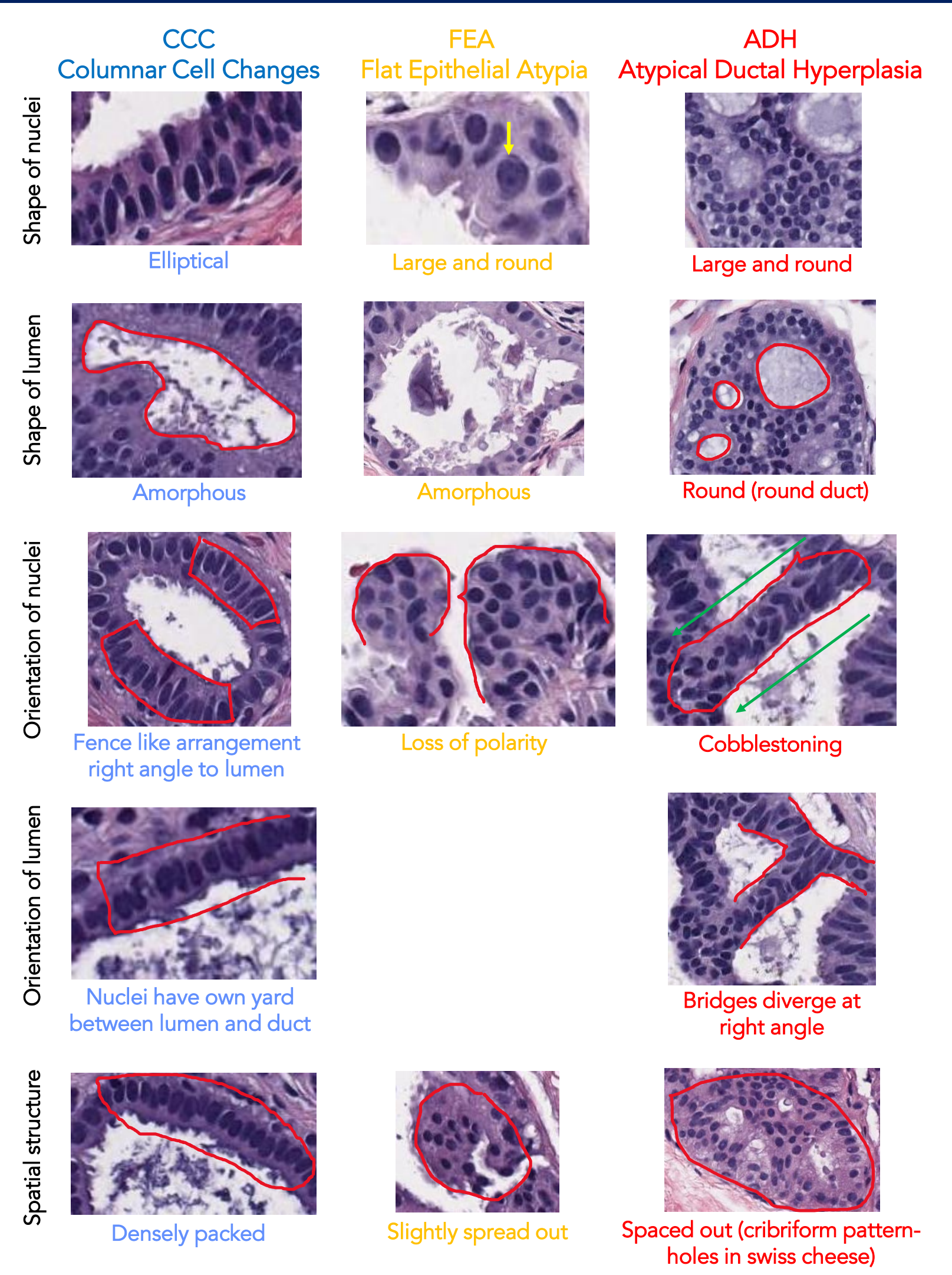
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1. SPECTRUM OF PREINVASIVE BREAST LESIONS

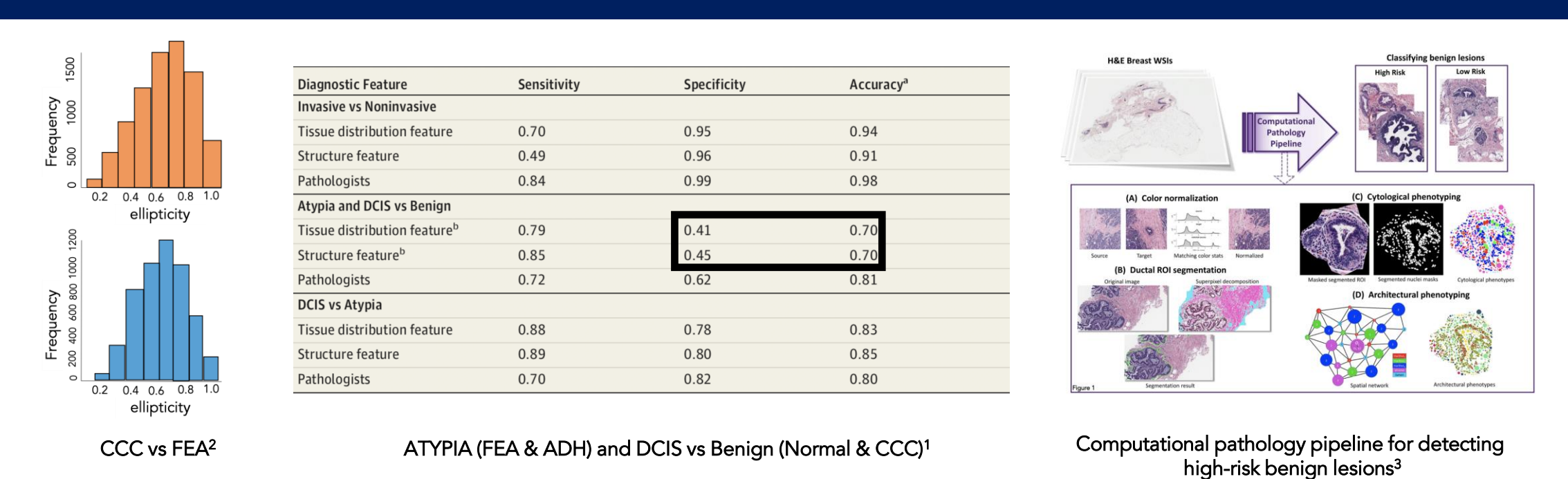


- Preinvasive lesions are associated with a higher risk of cancer, and may require additional interventions and treatments
- Diagnostic disagreements are remarkably high for these preinvasive lesions (48-52% between pathologists and experts for atypia)
- Preinvasive lesions present a more difficult classification scenario than the binary classification task of cancer vs no-cancer¹

2. STRUCTURAL VOCABULARY AND INSIGHTS

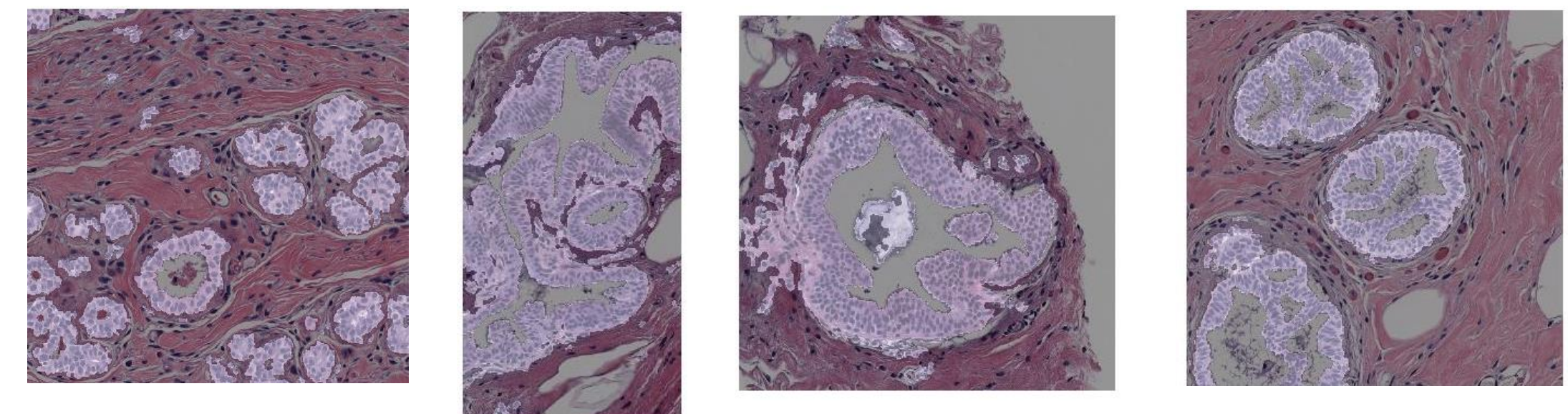


3. PREVIOUS WORK



4. COMPUTATIONAL PATHOLOGY

SEGMENT DUCTS (AUTOMATED)



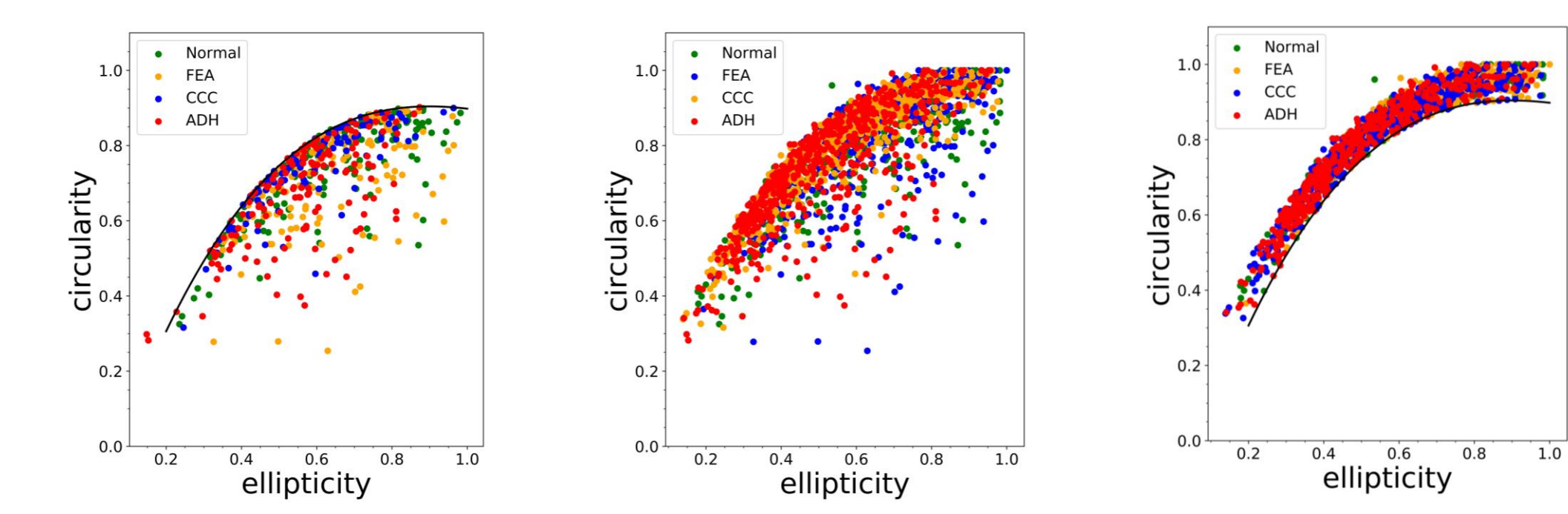
SEGMENT NUCLEI (MANUAL)



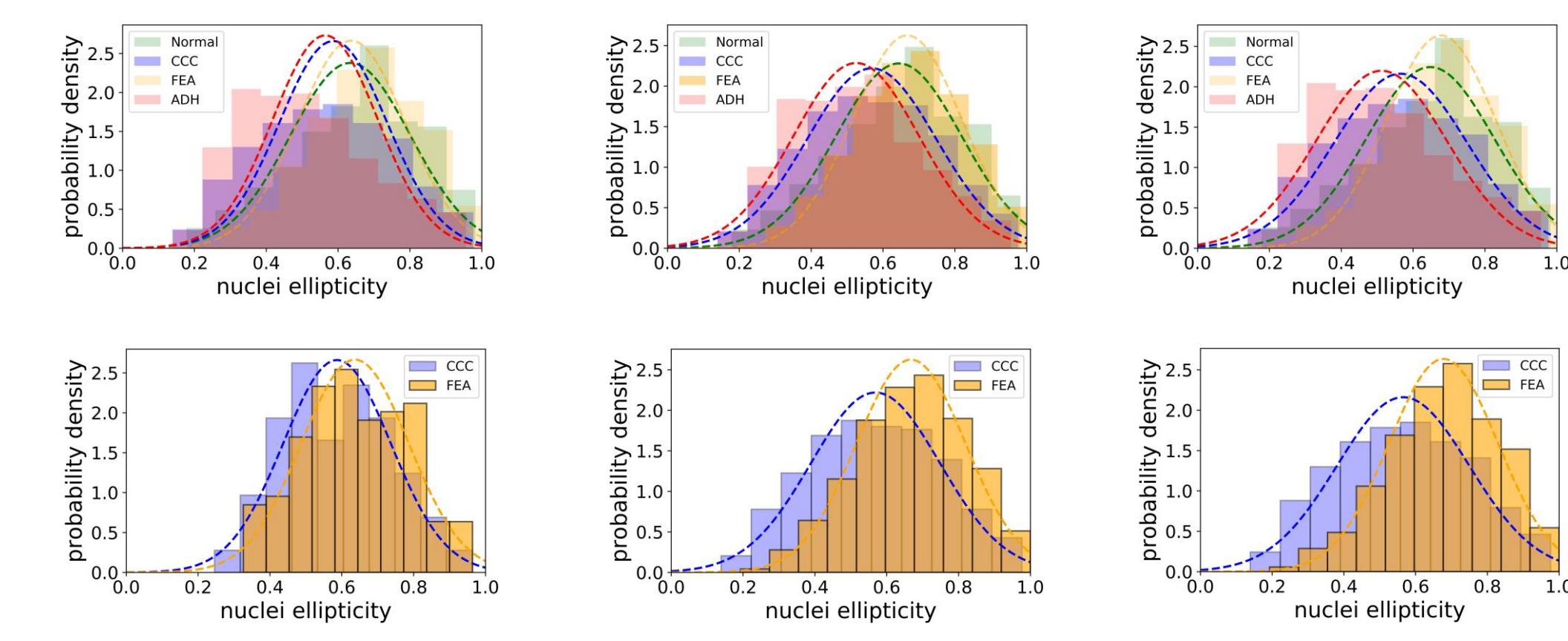
MEASURE ELLIPTICITY AND CIRCULARITY

$$\text{ellipticity} = \frac{\text{minor axis}}{\text{major axis}}$$

$$\text{circularity} = \frac{4\pi \times \text{Area}}{\text{Perimeter}^2}$$



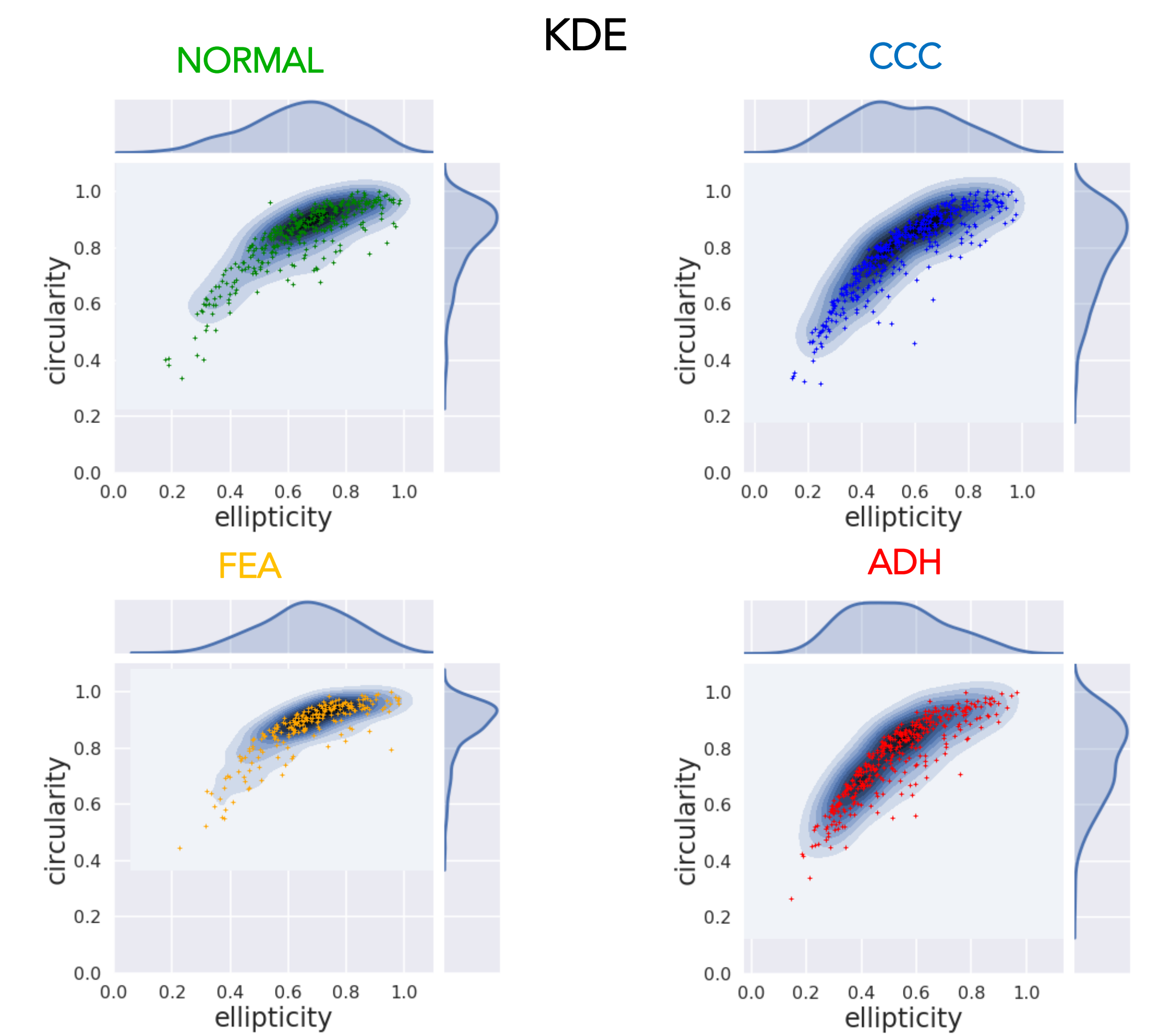
FILTER NUCLEI TO IMPROVE ATYPIA DETECTION



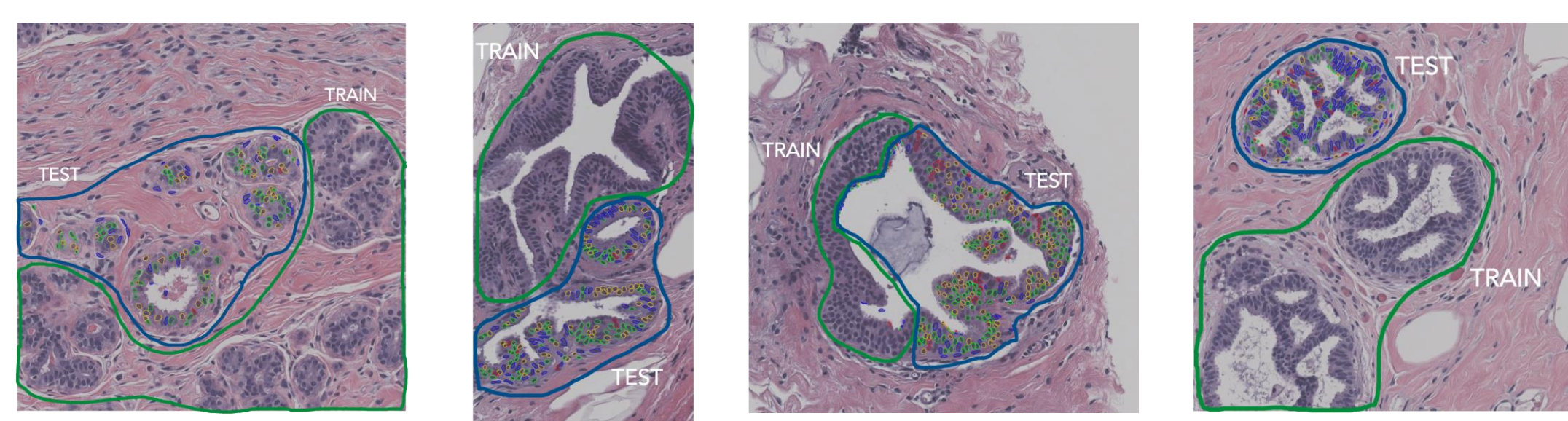
	μ	σ		μ	σ		μ	σ
NORMAL	0.634	0.167	NORMAL	0.644	0.175	NORMAL	0.647	0.177
CCC	0.586	0.149	CCC	0.568	0.179	CCC	0.565	0.185
FEA	0.636	0.149	FEA	0.667	0.152	FEA	0.678	0.151
ADH	0.564	0.146	ADH	0.525	0.174	ADH	0.512	0.181

Group	Observations	Mean	Degrees of Freedom	p-value	95% Confidence Interval	
					Lower	Upper
FEA	433	0.678	974.33	< 0.0001	-0.134	-0.091
CCC	542	0.565				

5. KERNEL DENSITY ESTIMATES TO CLASSIFY



CLASSIFY NUCLEI



RESULTS (WORK IN PROGRESS)

NORMAL	44.13	NORMAL	35.98	NORMAL	45.55	NORMAL	30.98
CCC	21.37	CCC	31.30	CCC	13.22	CCC	46.19
FEA	33.10	FEA	28.97	FEA	34.19	FEA	11.41
ADH	1.38	ADH	3.74	ADH	9.03	ADH	11.41

6. CURRENT WORK

- Automate nuclei segmentation (by-product of duct segmentation work)
- Encode other elements of the shape and orientation vocabulary for nuclei and lumen, e.g., picket fence, area, packing density
- Encode additional spatial structure and statistics
- How discriminative are the shape and orientation properties of nuclei and lumen?
- Extend the spectrum of breast lesions with DCIS and Invasive types

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