

AI-assisted glomerulosclerosis scoring using GHOST

Unbiased objective and quantitative histopathology

At Gubra, we have developed an AI-assisted image analysis strategy, GHOST (Gubra Histopathological Objective Scoring Technology) to automatically perform histopathological glomerulosclerosis scoring in PAS stained kidney sections from experimental disease models with glomerulopathy.

Automated AI-assisted image analysis strategy

Automatic AI-assisted scoring of glomeruli is performed as a two step process. Firstly, all glomeruli are detected and delineated using a neural network. Next, each glomerulus is assigned a glomerulosclerosis score by a second neural network. Approximately 100 glomeruli are scored per mouse kidney section.

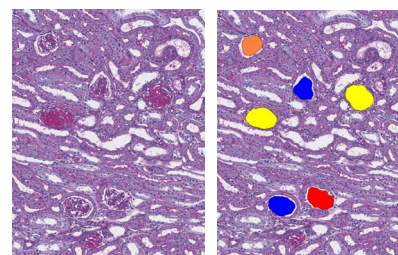
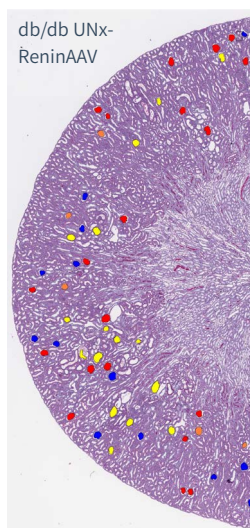
Glomerulosclerosis scoring system

Glomerulosclerosis is classified using a five-point scale according to the fraction of the capillary tuft affected:

Cohen's Kappa: 0.78

0	175	23	3	1	0
1	46	70	30	8	1
2	5	27	69	31	2
3	0	3	20	63	17
4	1	0	1	9	114
	0	1	2	3	4

GHOST confusion matrix demonstrates strong performance



- GS0 (normal)
- GS1 (<25%)
- GS2 (<50%)
- GS3 (<75%)
- GS4 (global)

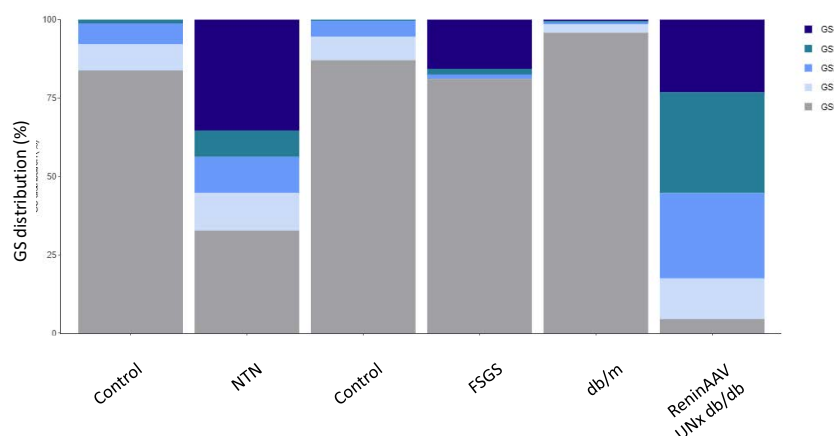
AI-assisted glomerulosclerosis scoring using GHOST in PAS stained kidney sections from hypertensive uninephrectomized db/db mice.

Glomerulosclerosis scoring across glomerulopathy models

Using the GHOST strategy, glomerulosclerosis is scored across different rodent models of glomerulopathy and each individual model display a unique "glomerulosclerosis fingerprint".

Models investigated include NTN (nephrotoxic nephritis, anti-GBM serum-induced), FSGS (focal segmental glomerulosclerosis, Adriamycin-induced) and diabetic nephropathy in ReninAAV UNx db/db mice.

Glomerulosclerosis distribution



GHOST assessment of glomerulosclerosis in three mouse models with glomerulopathy.