

Impact of tissue section thickness on classification and assessment of morphological features of a Deep learning network

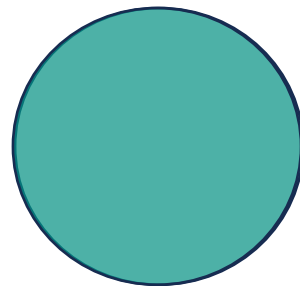
Ida Skovgaard Christiansen, Rasmus Hartvig, Thomas Hartvig Lindkær Jensen

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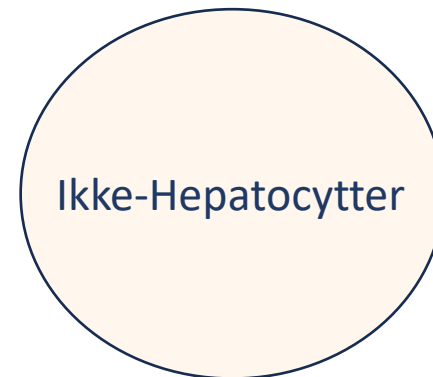
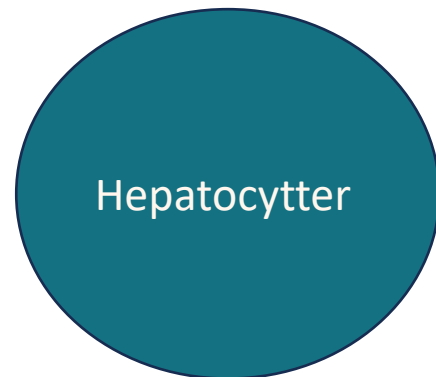
Mål

- Beskrivelse af hvilke morfologiske træk der bruges til at skelne celletyper
- Hvordan snittykkelse påvirker nøjagtighed af Deep learning baseret klassificering af enkeltceller



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Materiale og metode

Levervæv skåret på

Mikrotom

2 μm

4 μm

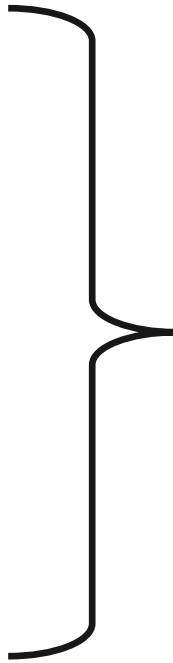
6 μm

8 μm

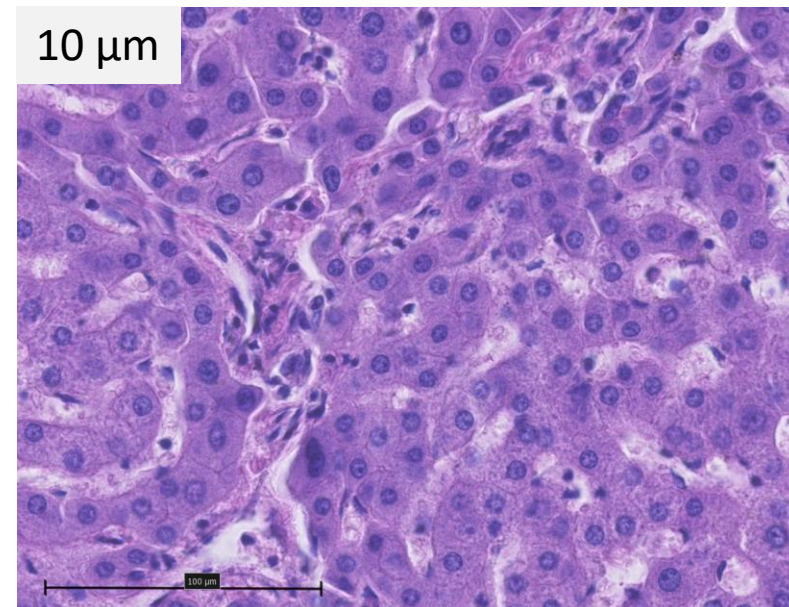
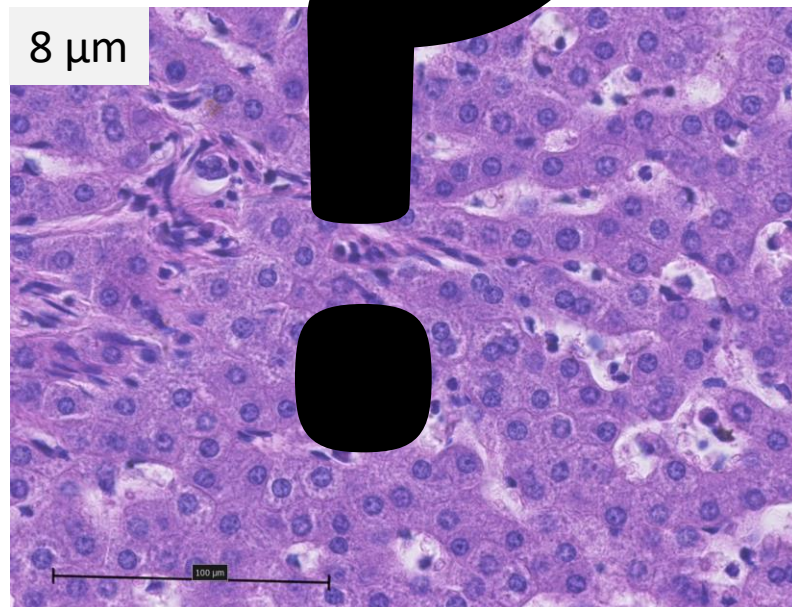
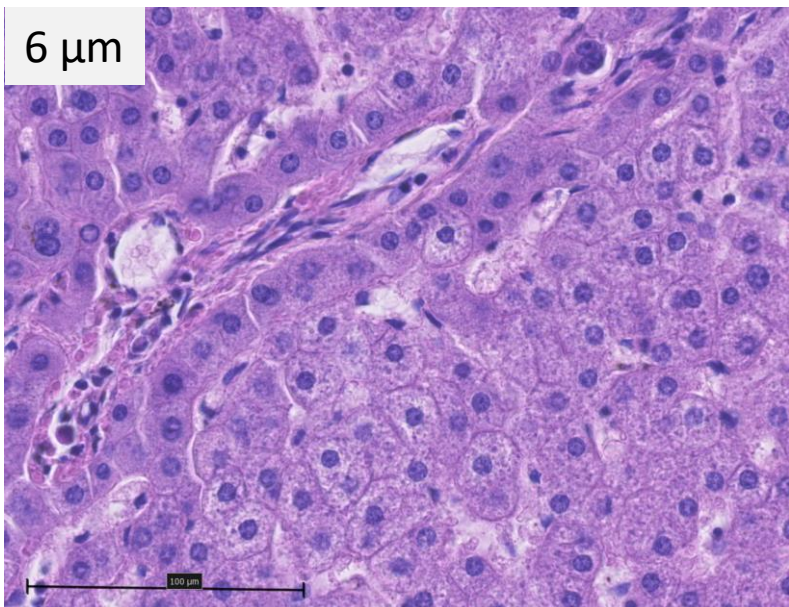
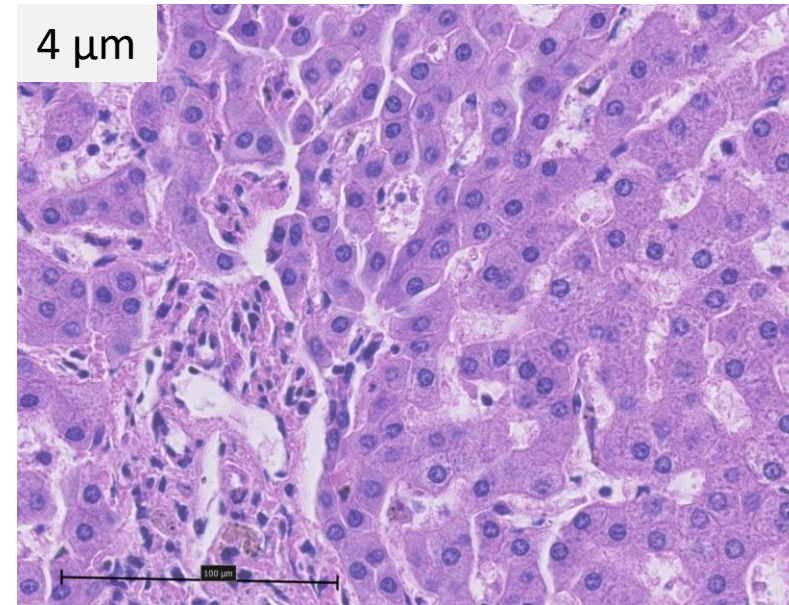
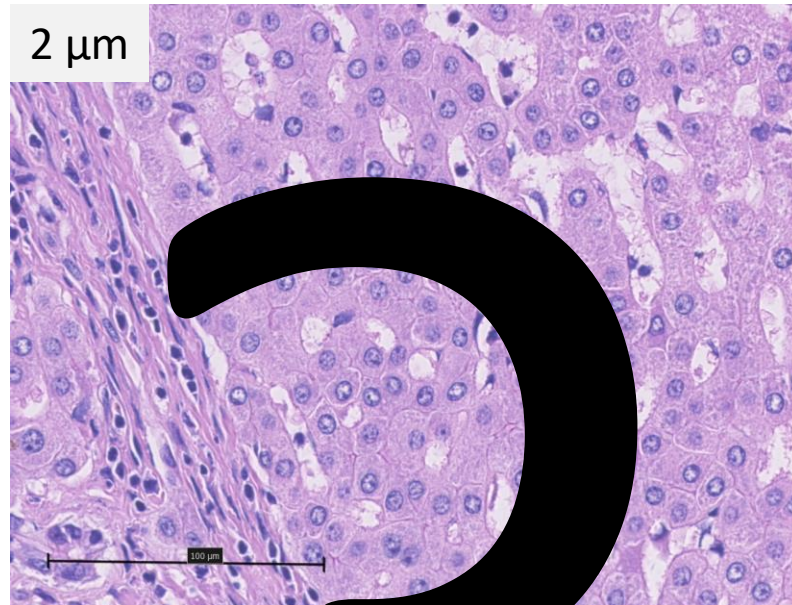
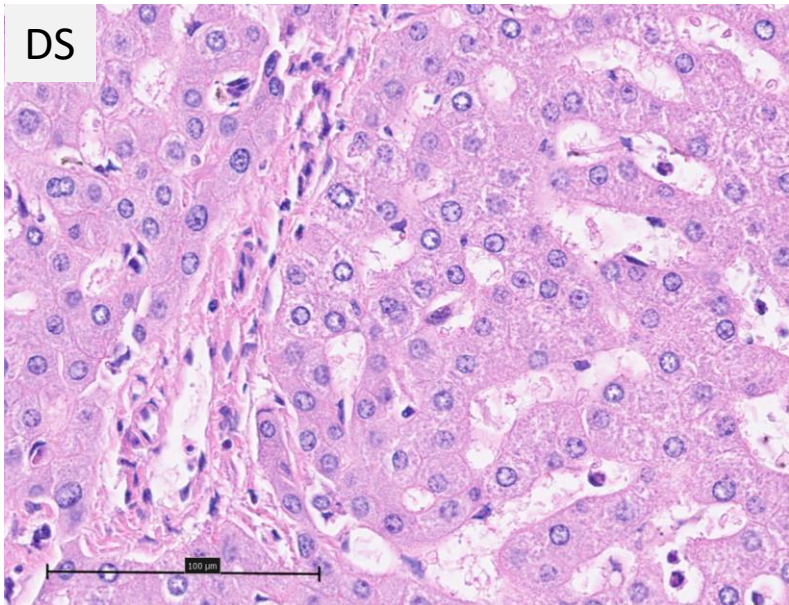
10 μm

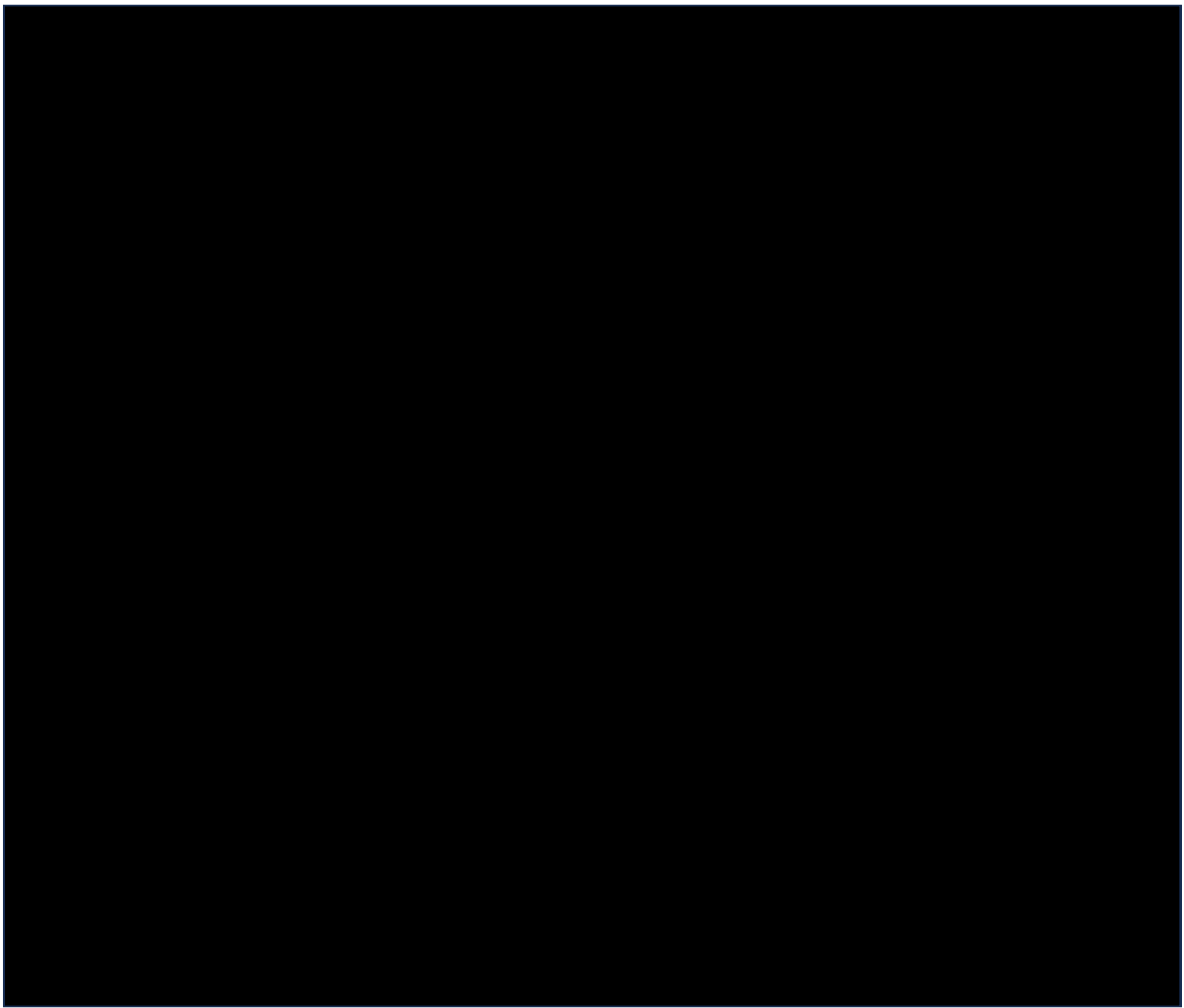
Skæremaskine (DS)

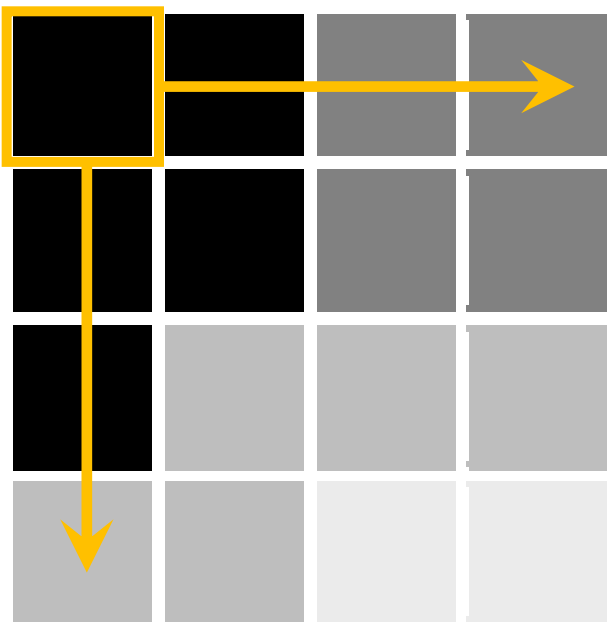
4 μm



6 snitttype-grupper







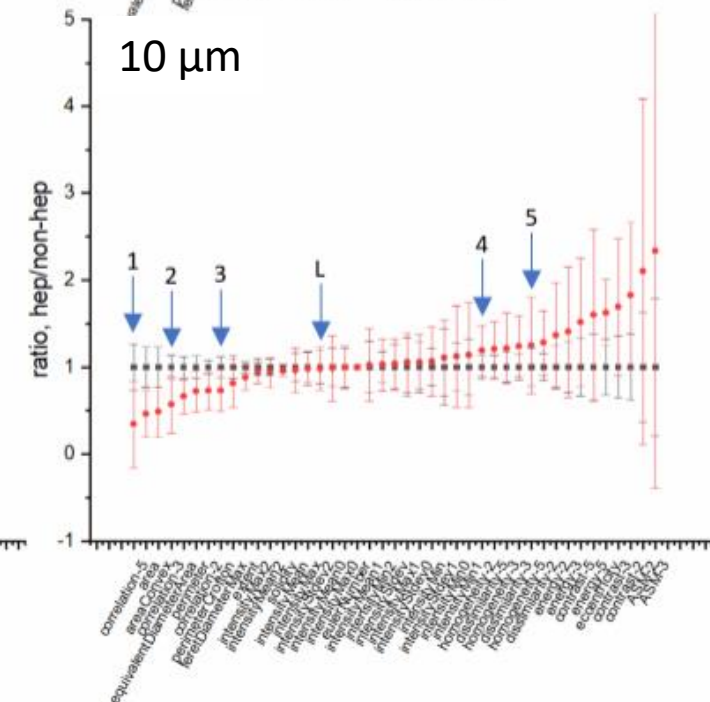
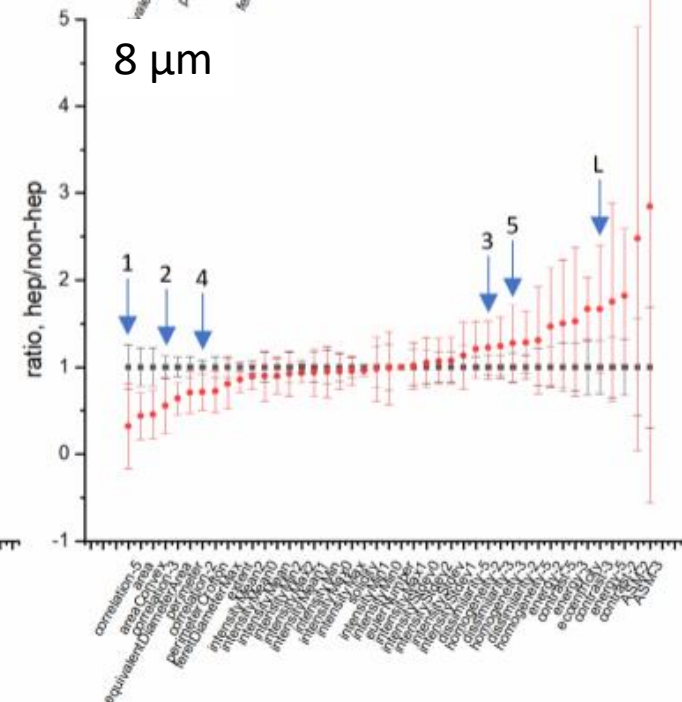
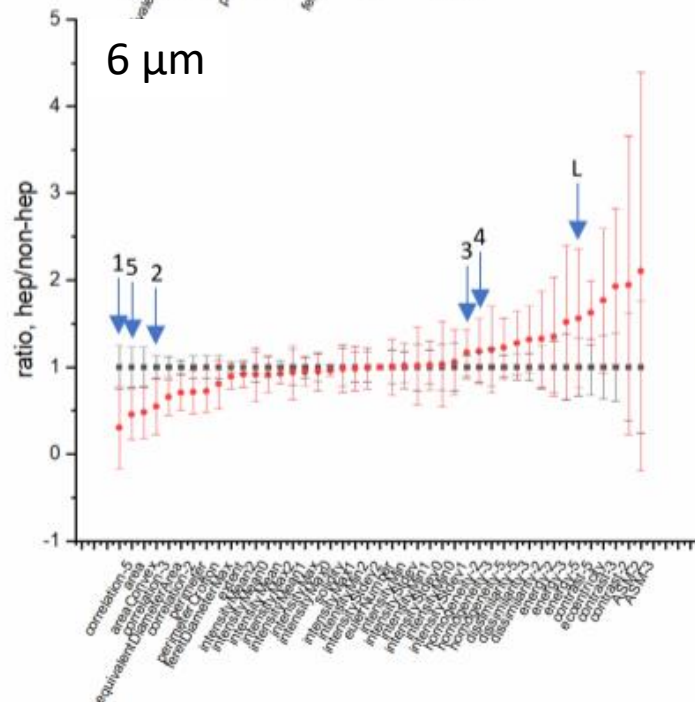
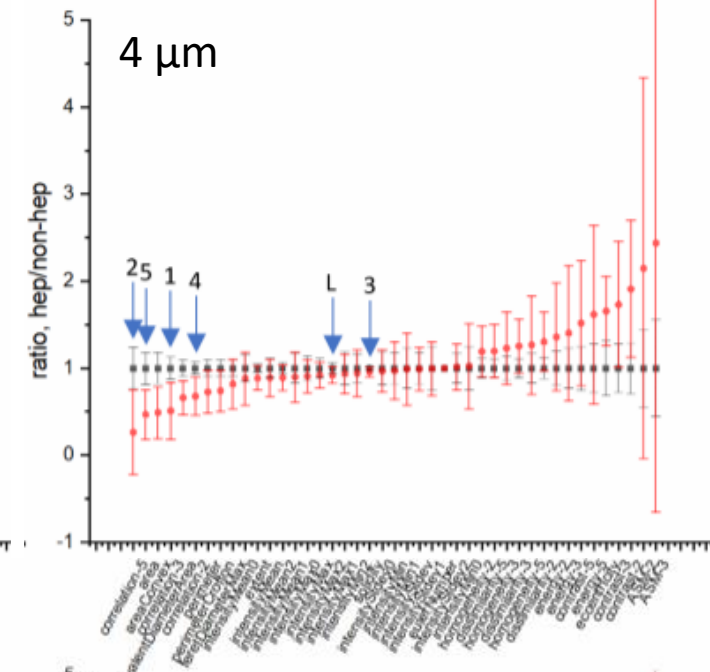
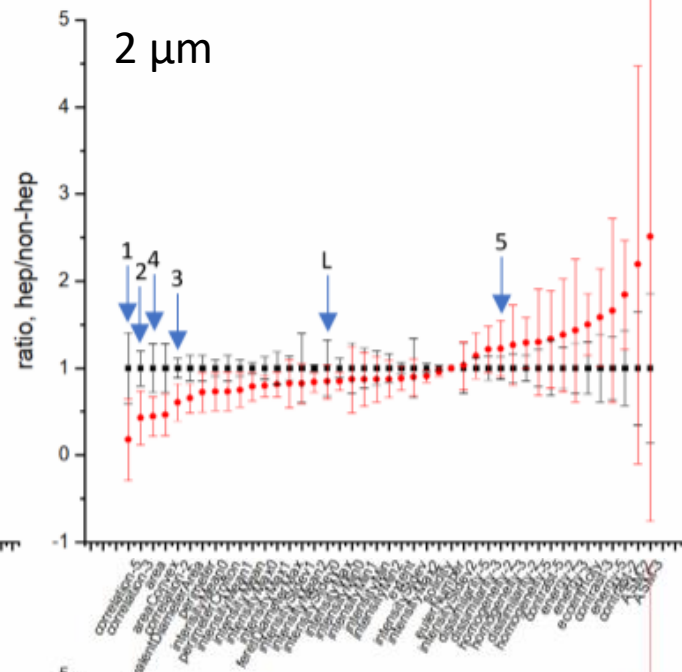
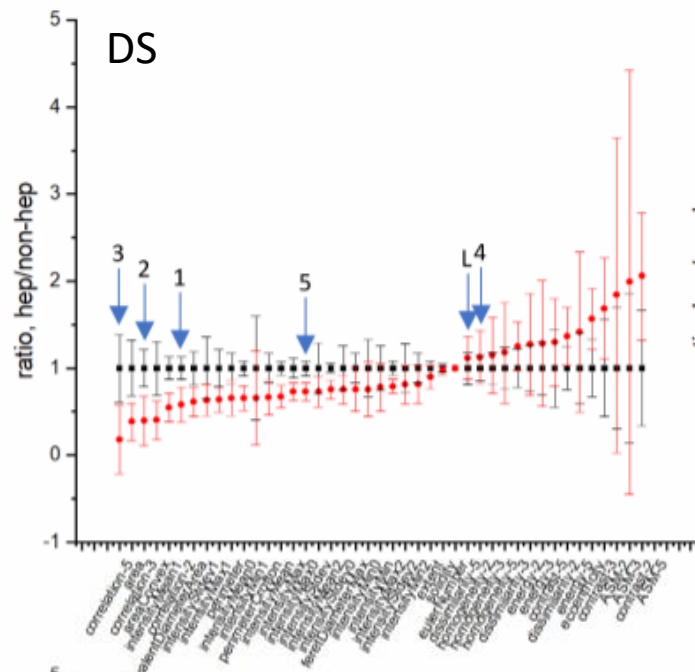
$$\sum_{i,j=0}^{N-1} \frac{P_{i,j}}{1 + (i-j)^2}$$

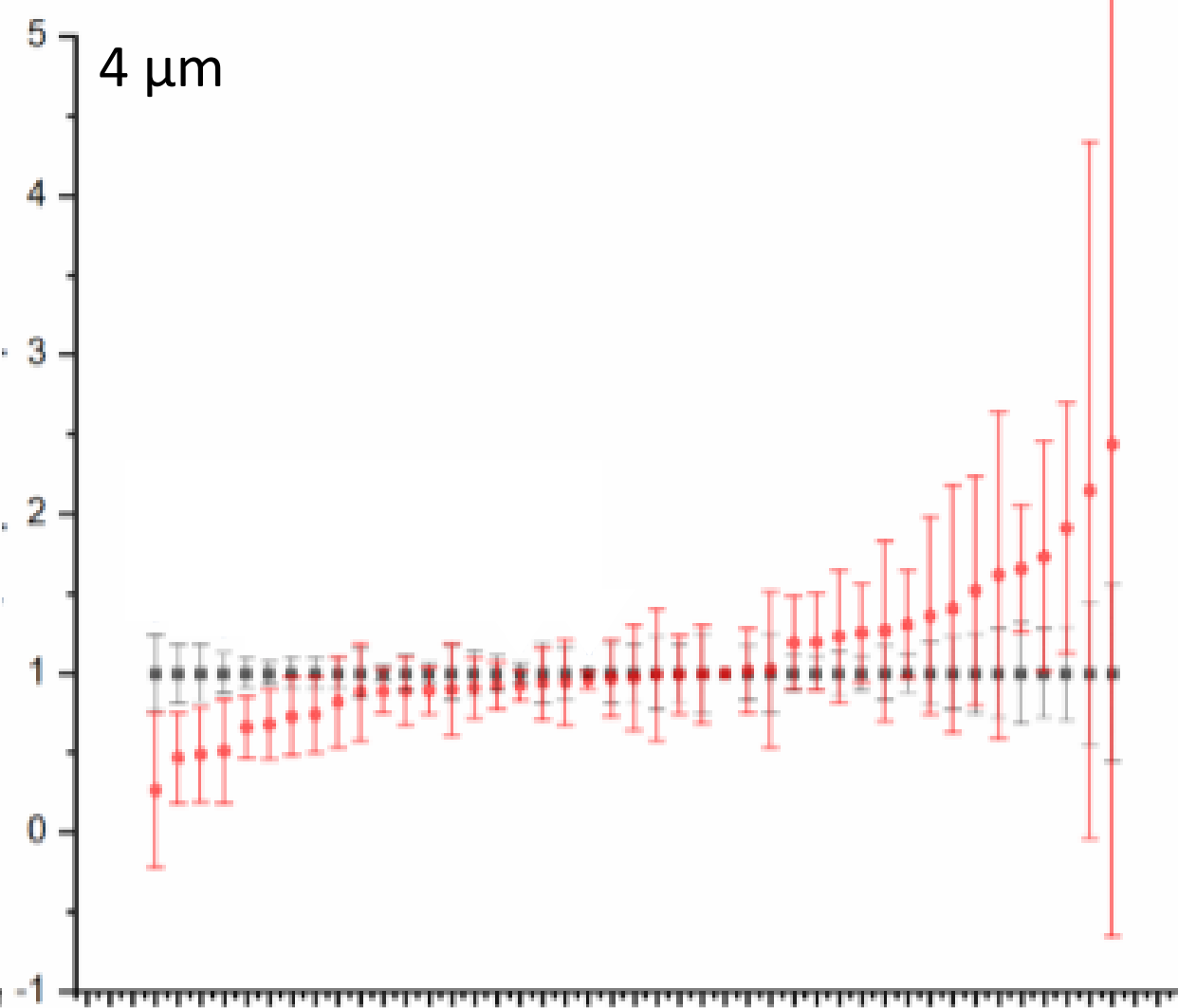
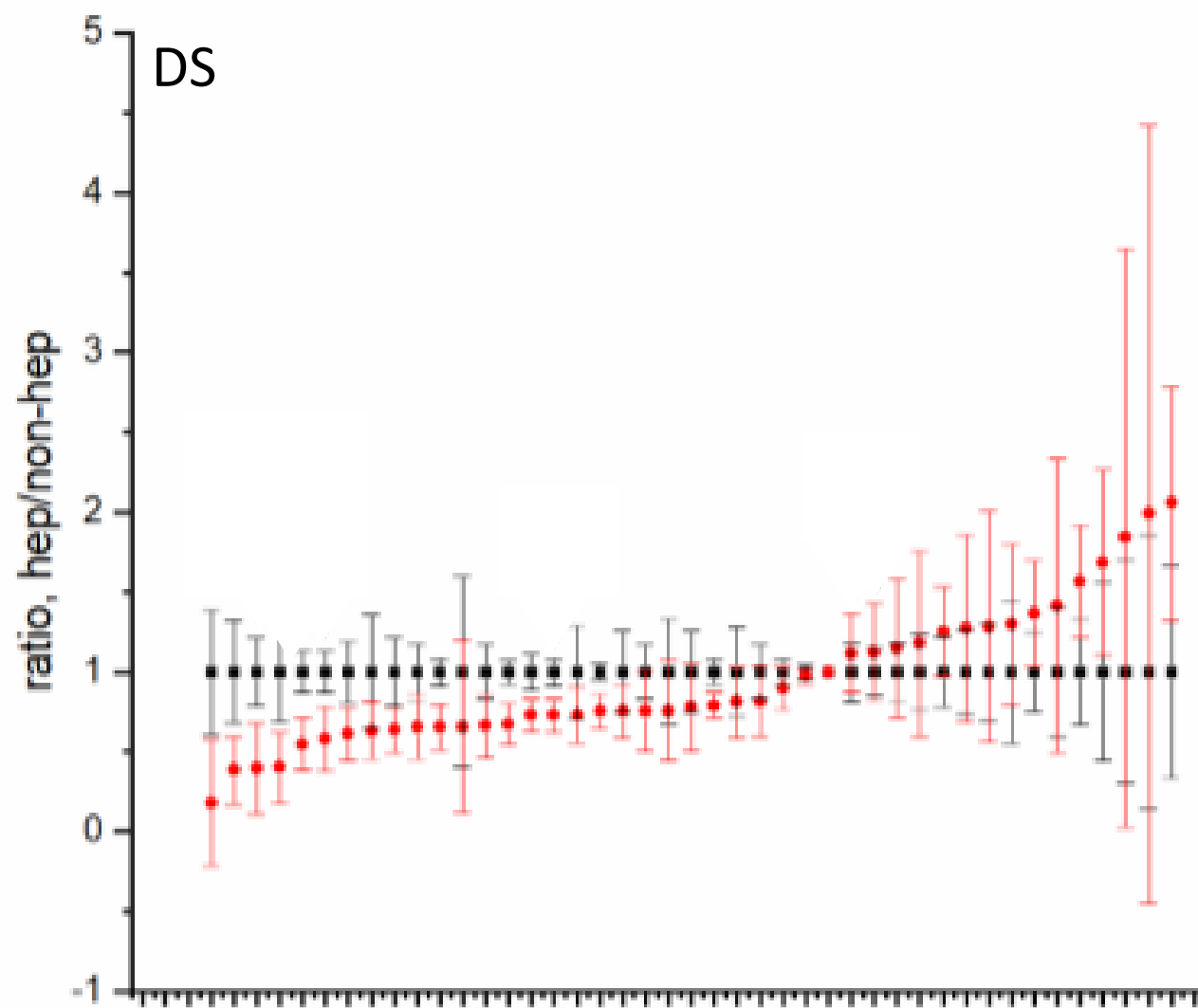
$$\sum_{i,j=0}^{N-1} P_{i,j} \left[\frac{(i - \mu_i)(j - \mu_j)}{\sqrt{(\sigma_i^2)(\sigma_j^2)}} \right]$$

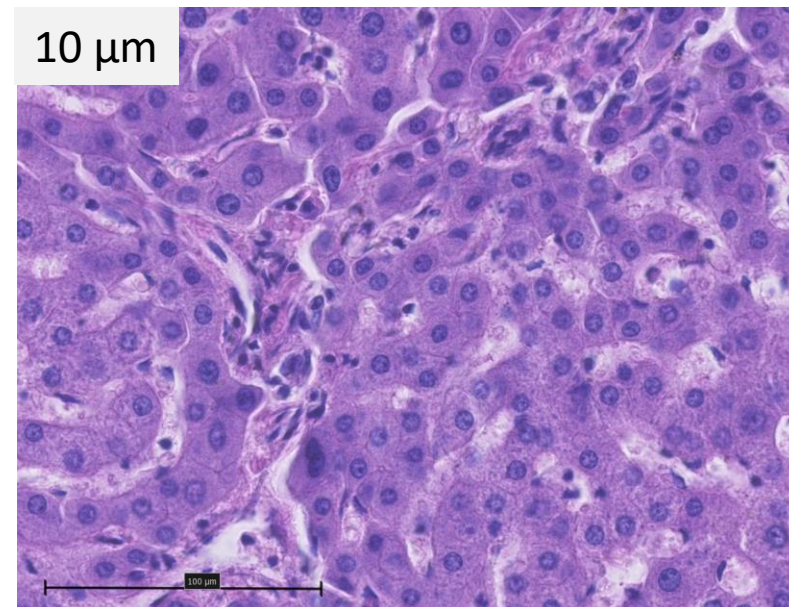
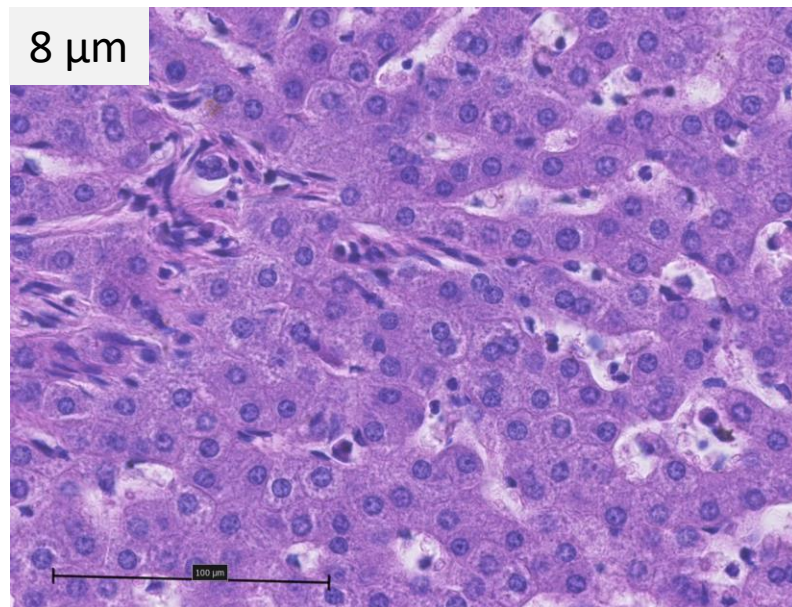
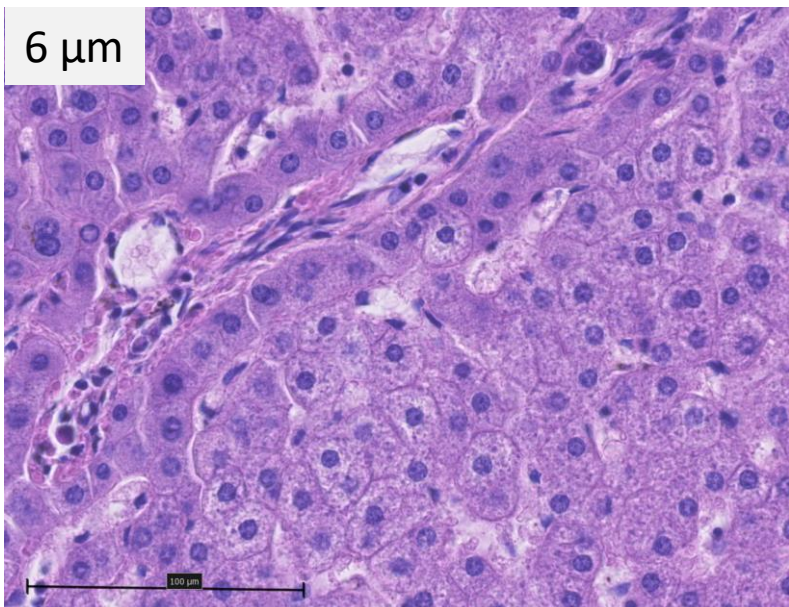
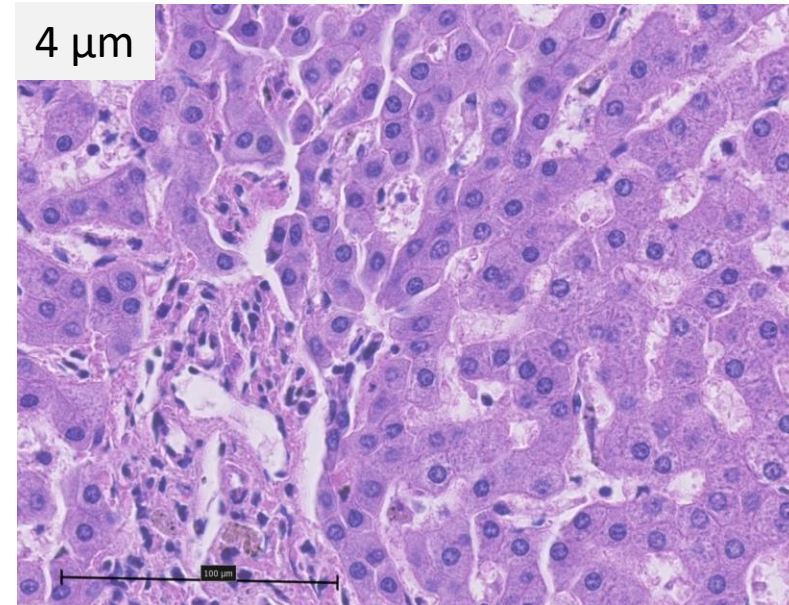
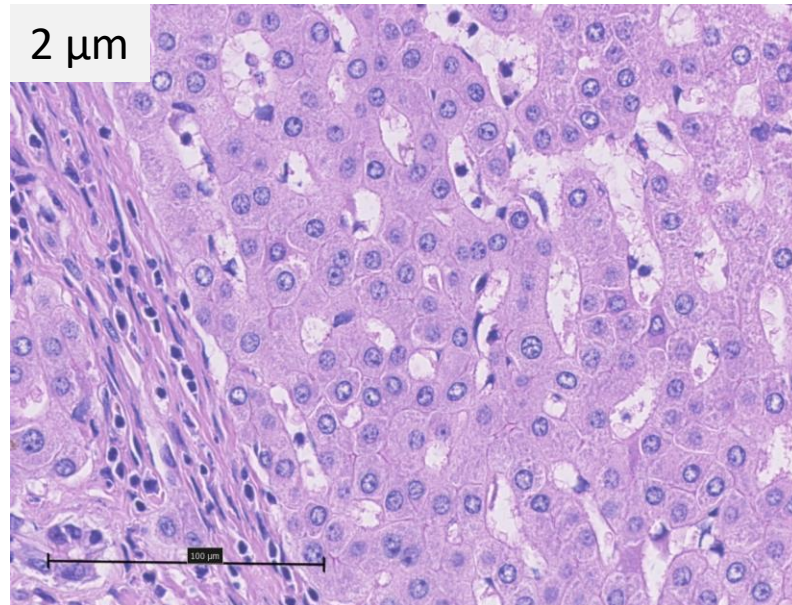
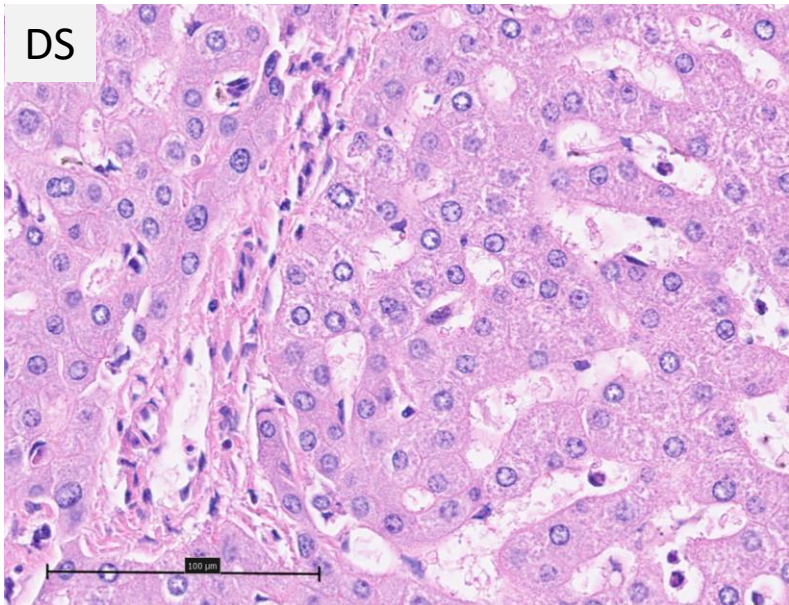
$$\sum_{i,j=0}^{N-1} P_{i,j} (-\ln P_{i,j})$$

Random forrest

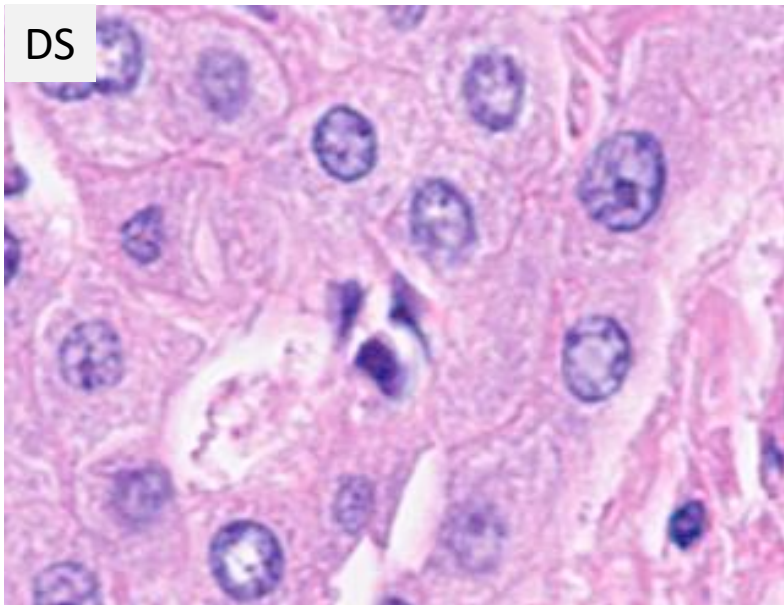
Prioritized importance	DS	2 μm	4 μm	6 μm	8 μm	10 μm
1th	Correlation-2	Correlation-5	Correlation-3	Correlation-5	Correlation-5	Correlation-5
2nd	Correlation-3	Correlation-3	Correlation-5	Correlation-3	Correlation-3	Correlation-3
3rd	Correlation-5	Correlation-2	Solidity	Homogeneity-2	Homogeneity-2	Correlation-2
4rd	Homogeneity-2	AreaFilled	Correlation-2	Homogeneity-3	Correlation-2	Homogeneity-2
5rd	IntensityMax	Homogeneity-2	AreaFilled	AreaFilled	Homogeneity-3	Homogeneity-3



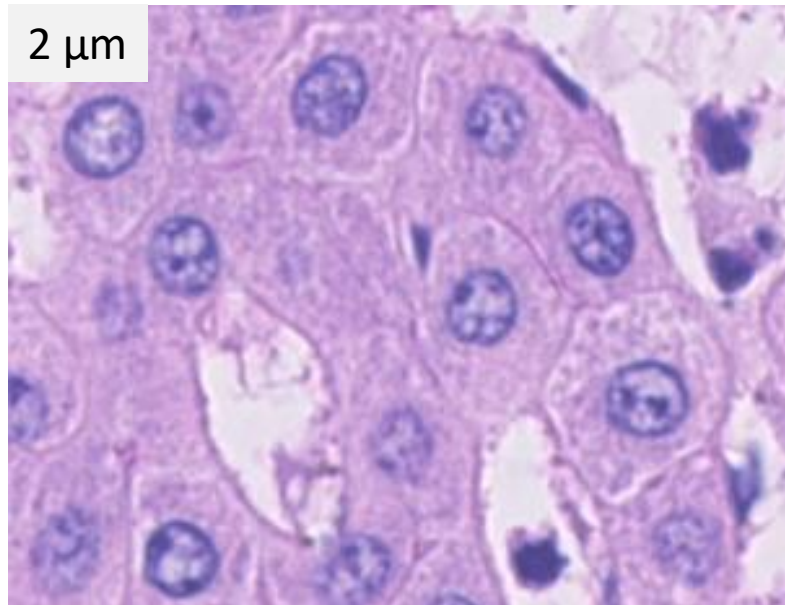




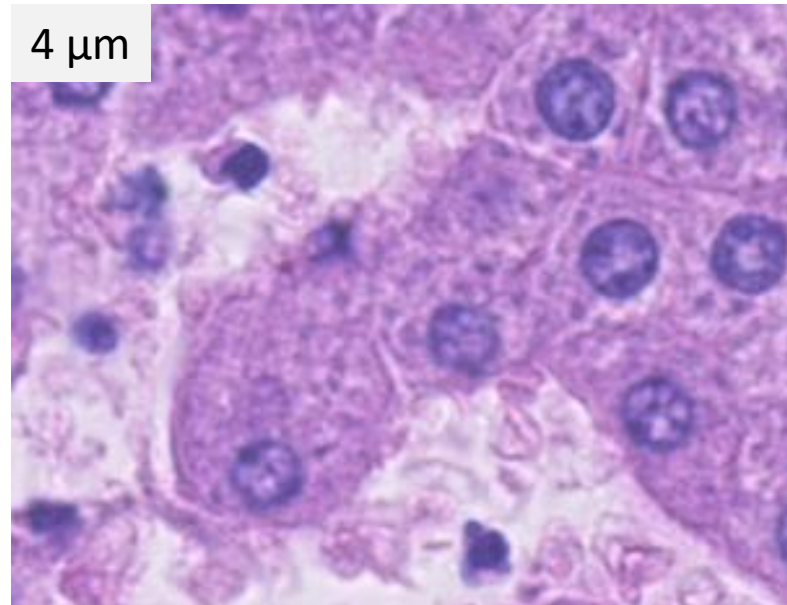
DS



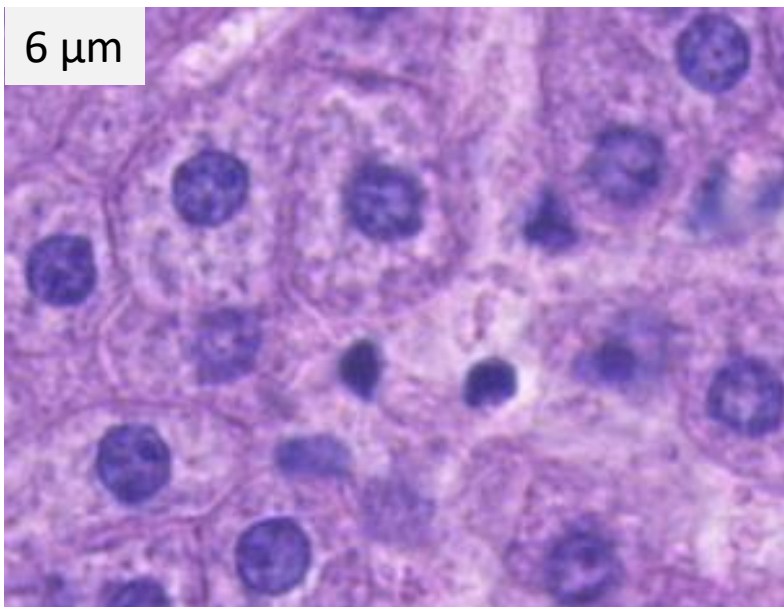
2 μ m



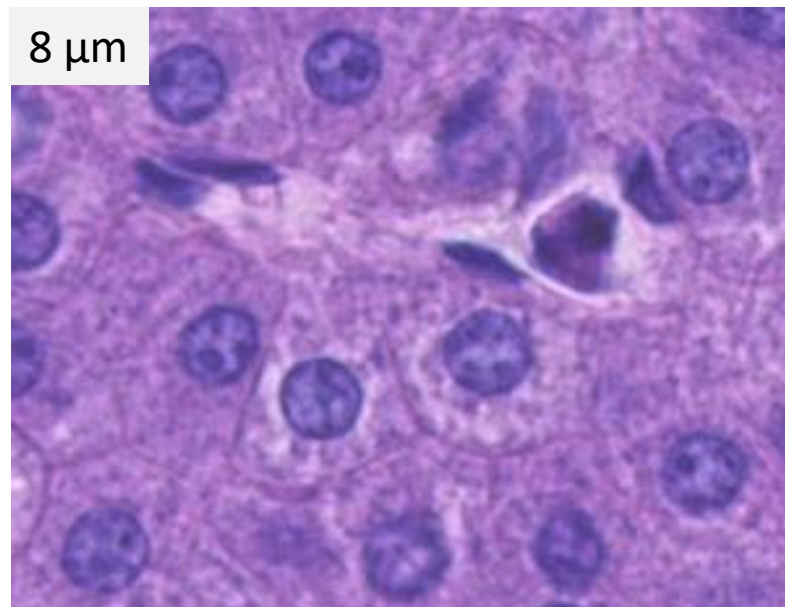
4 μ m



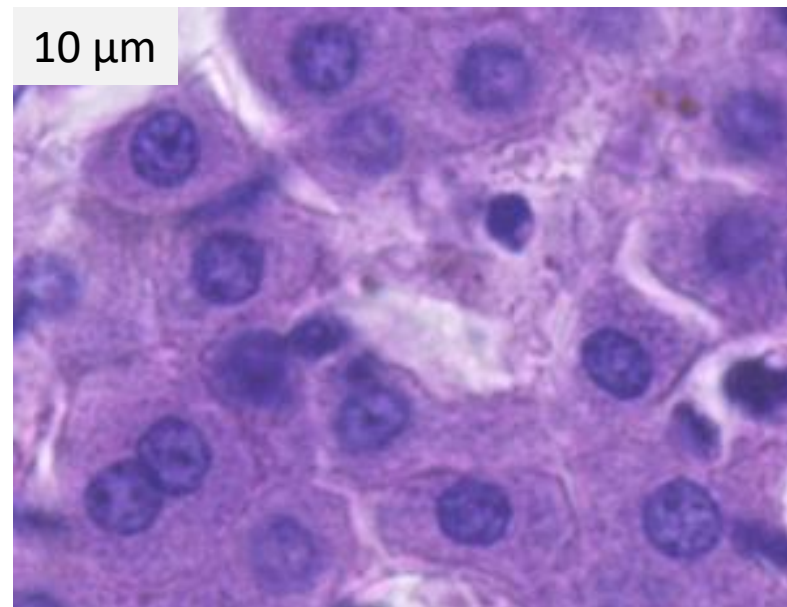
6 μ m



8 μ m

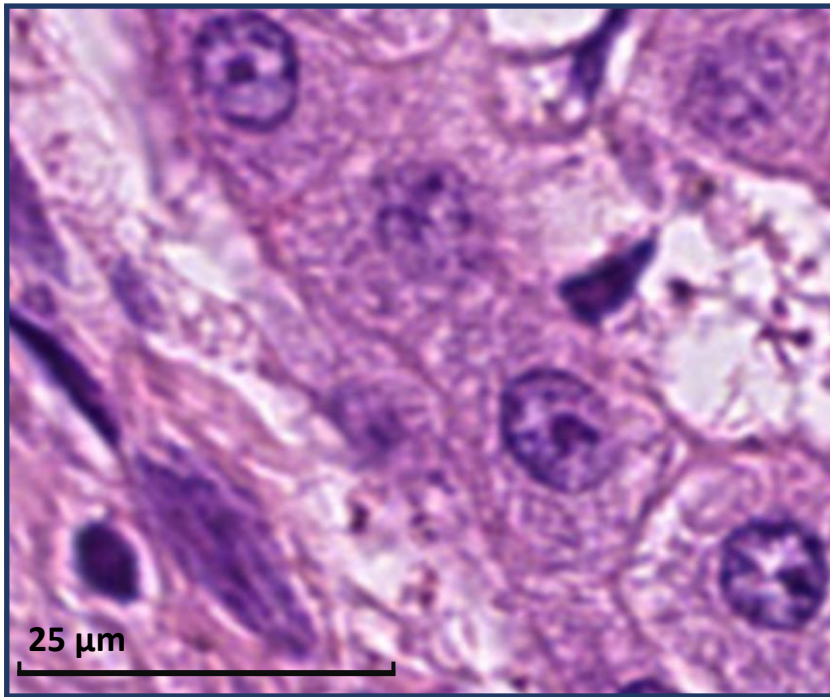
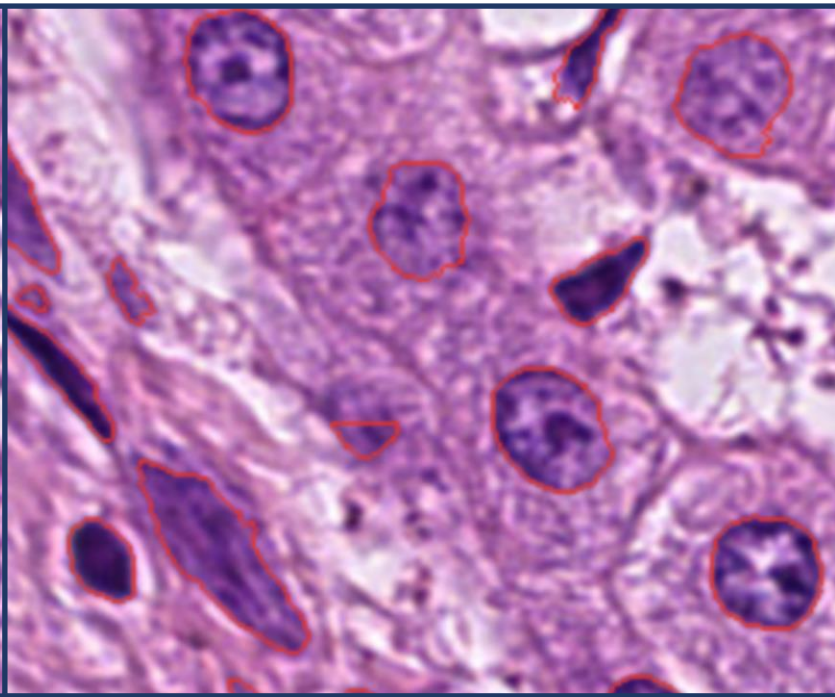
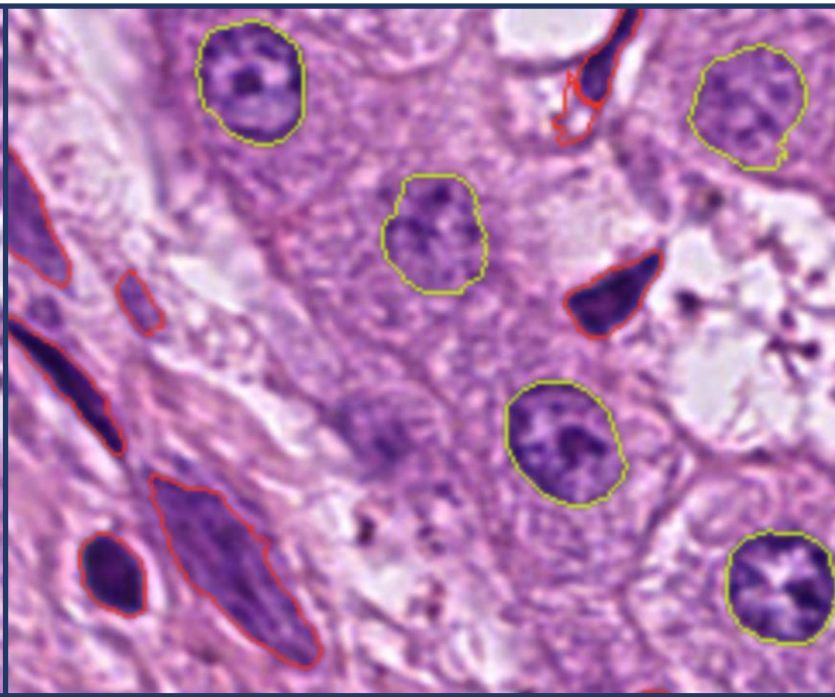


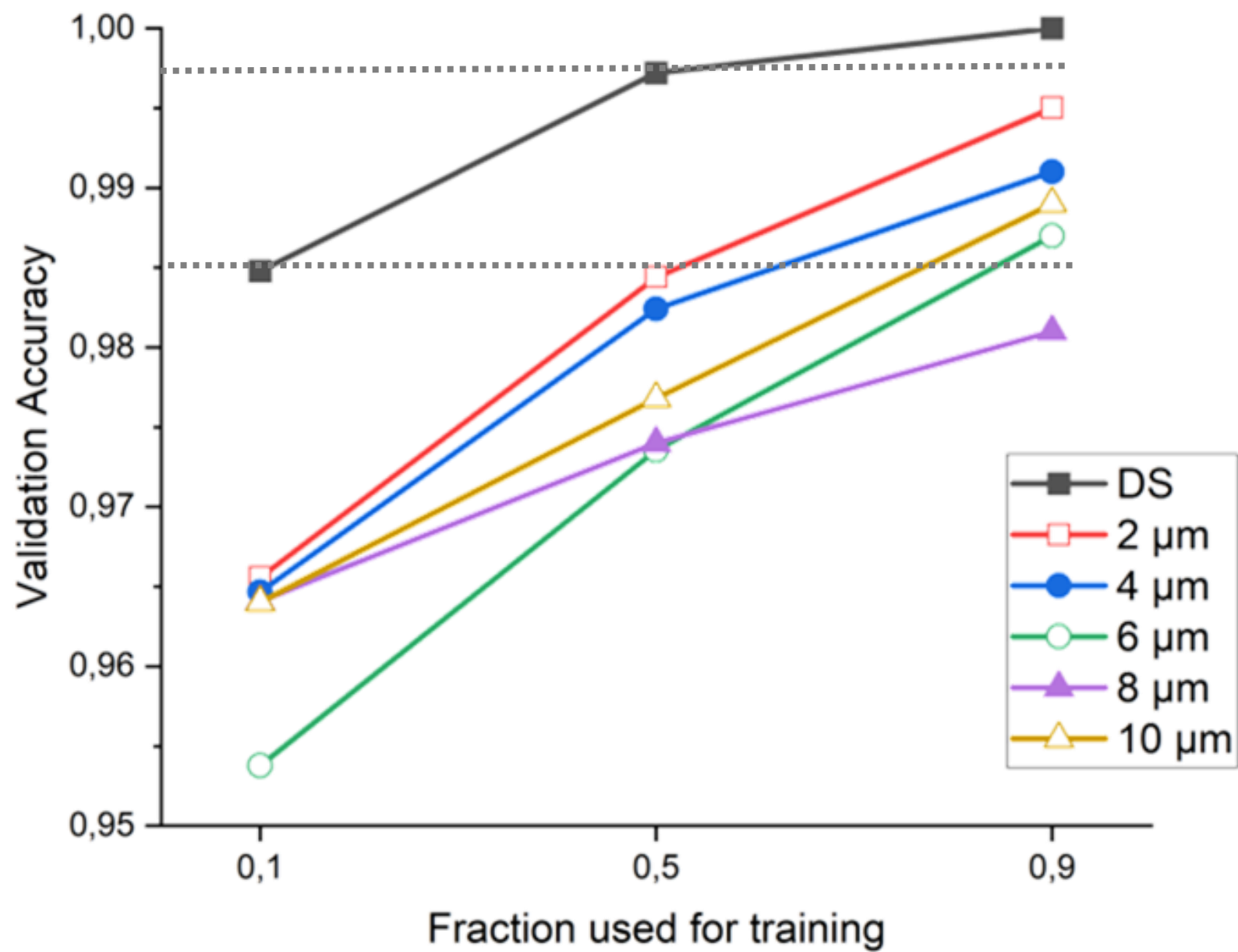
10 μ m



Deep learning model

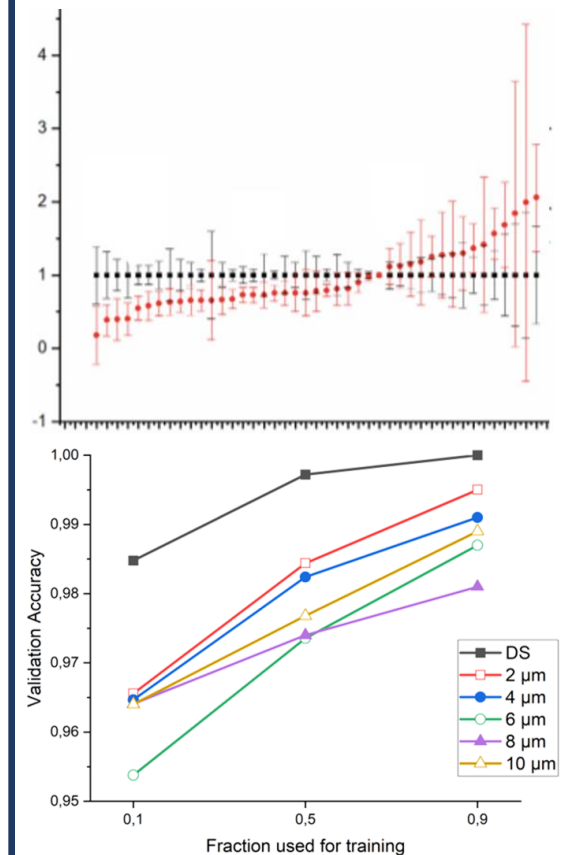
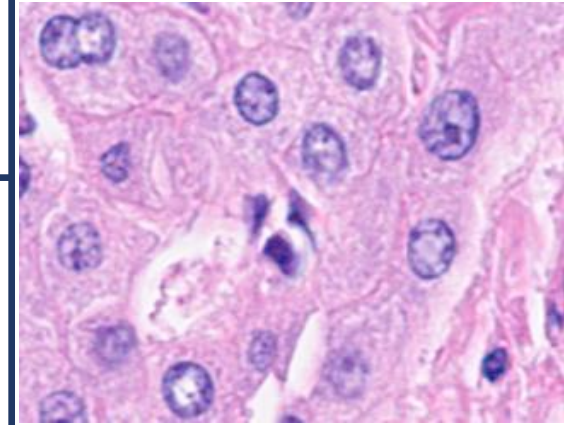
Deep learning model

		
Original billede	Præprocessering	Træning og annotering



Konklusion

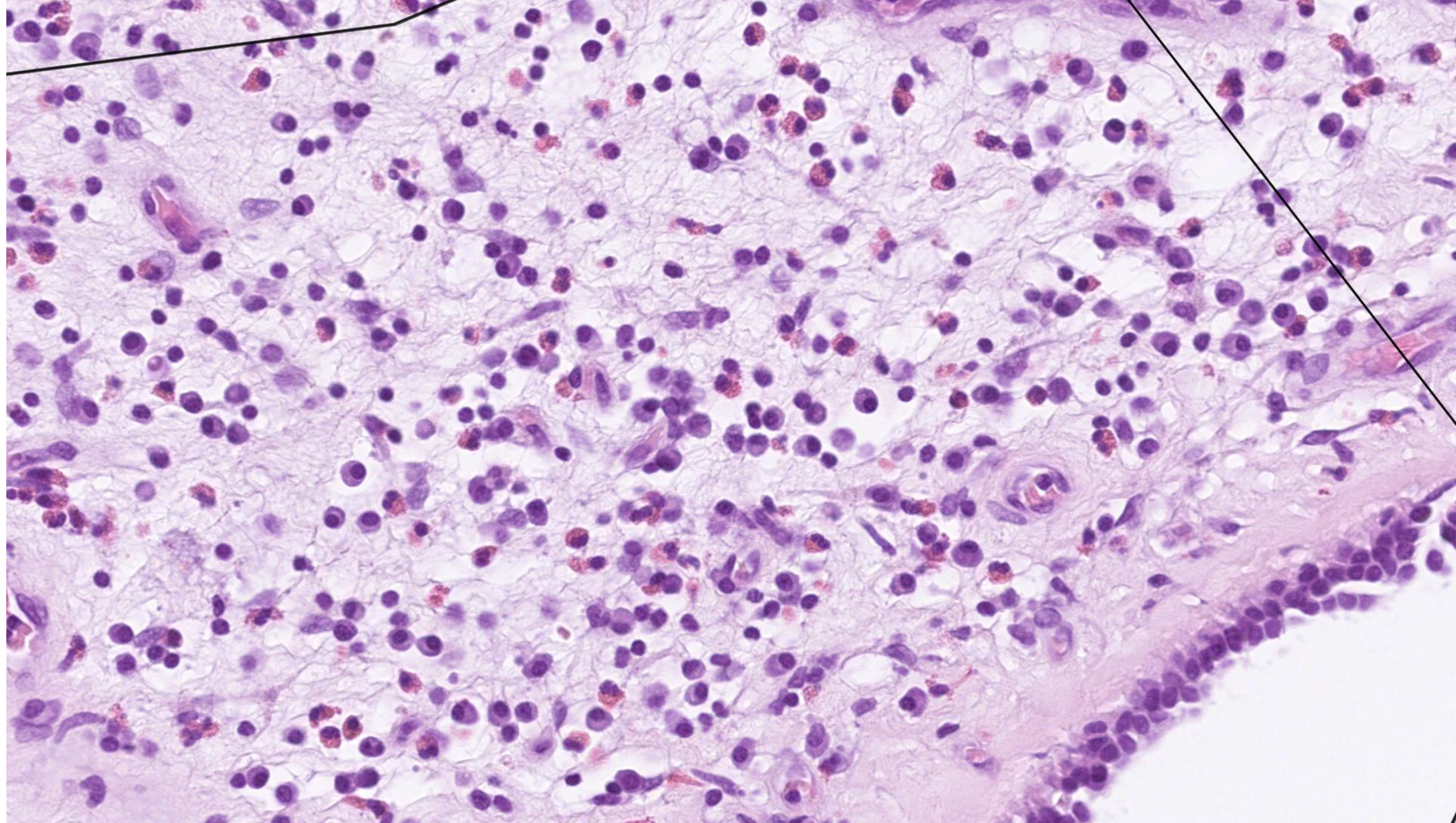
- Kromatinstruktur er vigtigst til at skelne celletyper
- Flere morfologiske features kan skelnes ved snit fra skæremaskinen
- Snit fra skæremaskine havde højest accuracy

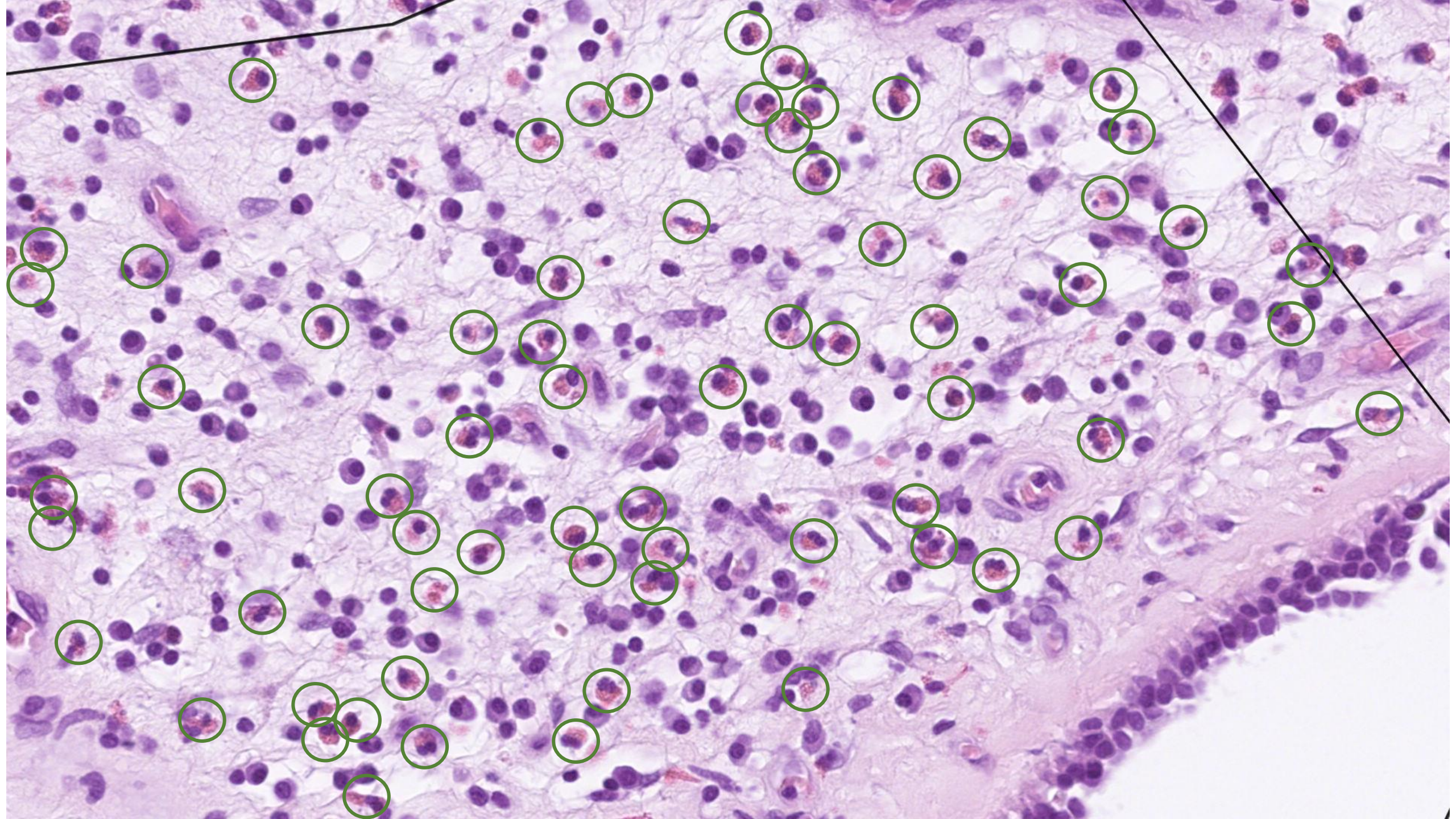




Perspektiver

- Klassificering af celletyper
 - Eosinofile granulocytter





Perspektiver

- Klassificering af celletyper
 - Eosinofile granulocytter
 - Tumorceller i primærtumor og metastase

tomorrow

(noun)

a mystical land where 99% of all
human productivity, motivation and
achievement is stored

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1

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2



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3



Materiale og metode

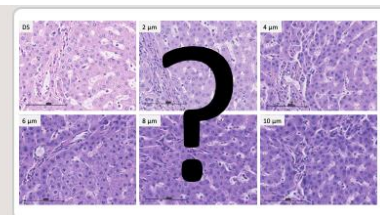
Levervæv skåret på Mikrotom

2 µm
4 µm
6 µm
8 µm
10 µm
4 µm

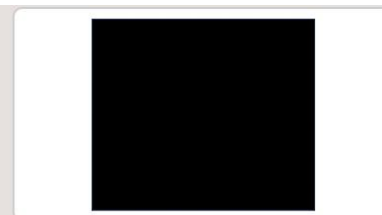
Skæremaskine (DS)

6 snittykke-grupper

4



5



6



$$\sum_{i,j=1}^N \frac{P_{i,j}}{(i-j)} \left[\frac{(-\mu)(i-\mu)}{(\sigma_i)(\sigma_j)} \right]$$

$$\sum_{i,j=1}^N P_{i,j} (-\ln P_{i,j})$$

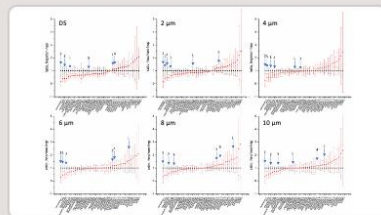
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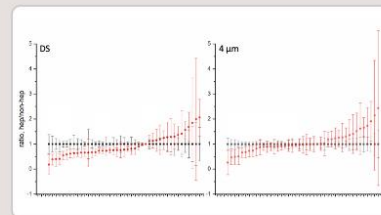
Random Forrest

Priority	DS	2 µm	4 µm	6 µm	8 µm	10 µm
1st	Correlation 0	Correlation 0	Correlation 0	Correlation 0	Correlation 0	Correlation 0
2nd	Correlation 0	Correlation 0	Correlation 0	Correlation 0	Correlation 0	Correlation 0
3rd	Correlation 0	Correlation 0	Correlation 0	Correlation 0	Correlation 0	Correlation 0
4th	Correlation 0	Correlation 0	Correlation 0	Correlation 0	Correlation 0	Correlation 0
5th	Correlation 0	Correlation 0	Correlation 0	Correlation 0	Correlation 0	Correlation 0

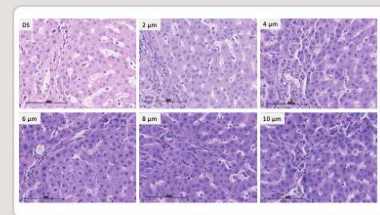
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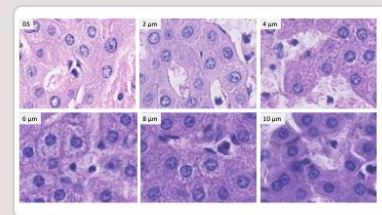
9



10



11



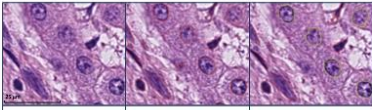
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Deep learning model

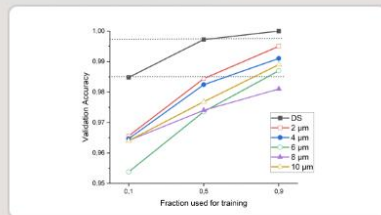
13

Deep learning model



Original billede Præprocessing Træning og annotering

14



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Konklusion

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16

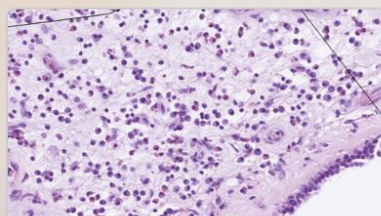


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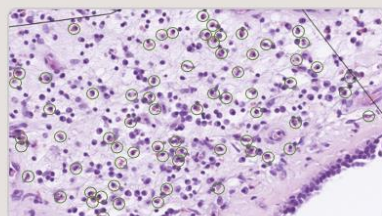
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19



20

Perspektiver

- Klassificering af celletyper
- Eosinofille granulocytter
- Tumorer i primærtumor og metastase

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