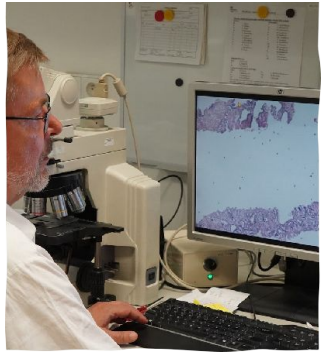
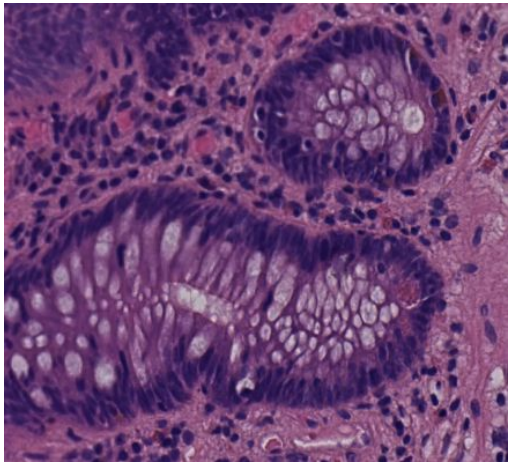
AI Solution for Inflammatory Bowel Disease

Tomáš Brázdil, Ondřej Fabián, Adam Kukučka, Vít Musil

Digital pathology



IBD



Nancy index 0 - 4 grading inflammation severity based on whole-slide images of colon tissue samples

The work comprises:

- Sample preparation and data acquisition (IKEM)
  Retrieve samples, select, scan, connect with clinical data (such as locality, Nancy index)
- Data preparation (IKEM, MUNI)
  - Scan level annotations: Clean-up labels (assignment correctness), data exploration
  - Image quality control
- Model training (MUNI)
  - Training on Cerit-SC infra, foundation models employed
- Model testing (IKEM, MUNI)
  - Metrics computation, visual inspection, pathologist’s feedback

IKEM Dataset

2019 WSI, labeled with Nancy index

	IKEM	FTN	KNL	all
train	1411	937	-	2348
test preliminary	302	200	88	590
test final	304	202	88	594
all	2017	1339	176	3532

	IKEM	FTN	KNL	all
Nancy 0	991	214	22	1227
Nancy 1	155	276	22	453
Nancy 2	403	316	56	775
Nancy 3	268	374	58	700
Nancy 4	200	159	18	377

Training Nancy 0-1 vs 2-4 predictor

Binary prediction: Class 1 = Nancy < 2

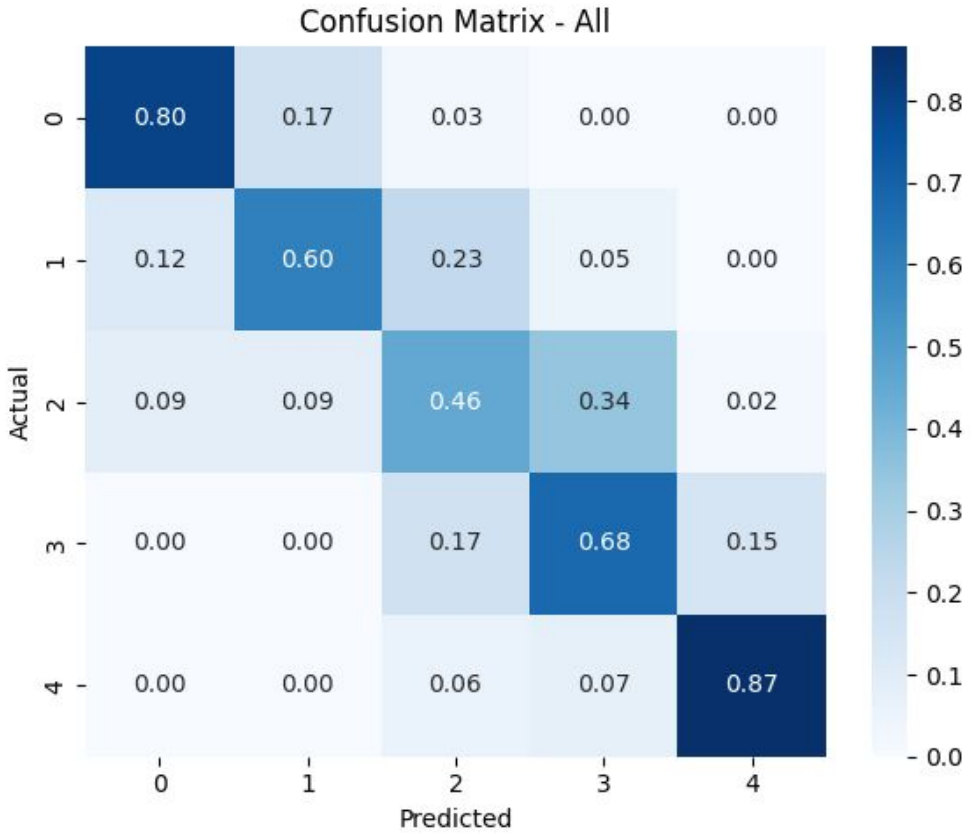
Class 2 = Nancy >= 2

- Foundation model (ProvGigapath)
- Folded training & eval
  Leave one out, 5 folds
- Trained to predict on small patches + summarization using attention

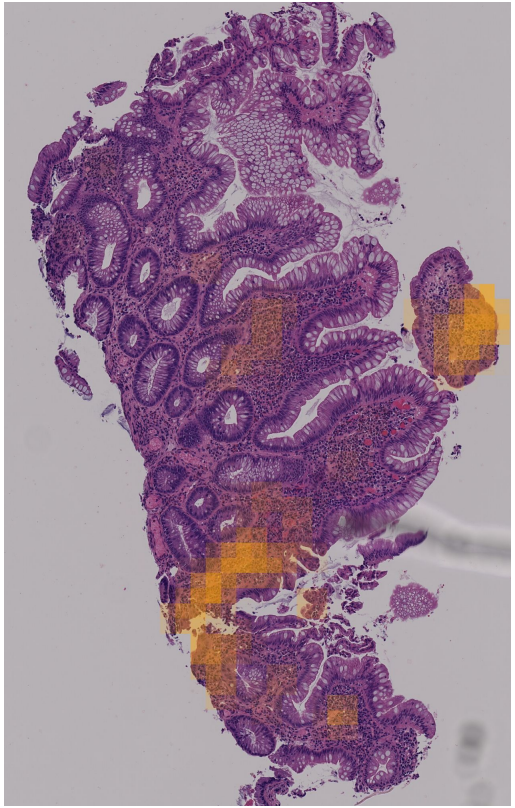
Fold	accuracy	sensitivity	specificity
1/5	0.9120	0.8455	0.9627
2/5	0.9014	0.8304	0.9477
3/5	0.9258	0.8814	0.9576
4/5	0.9046	0.8647	0.9400
5/5	0.8587	0.8016	0.9045

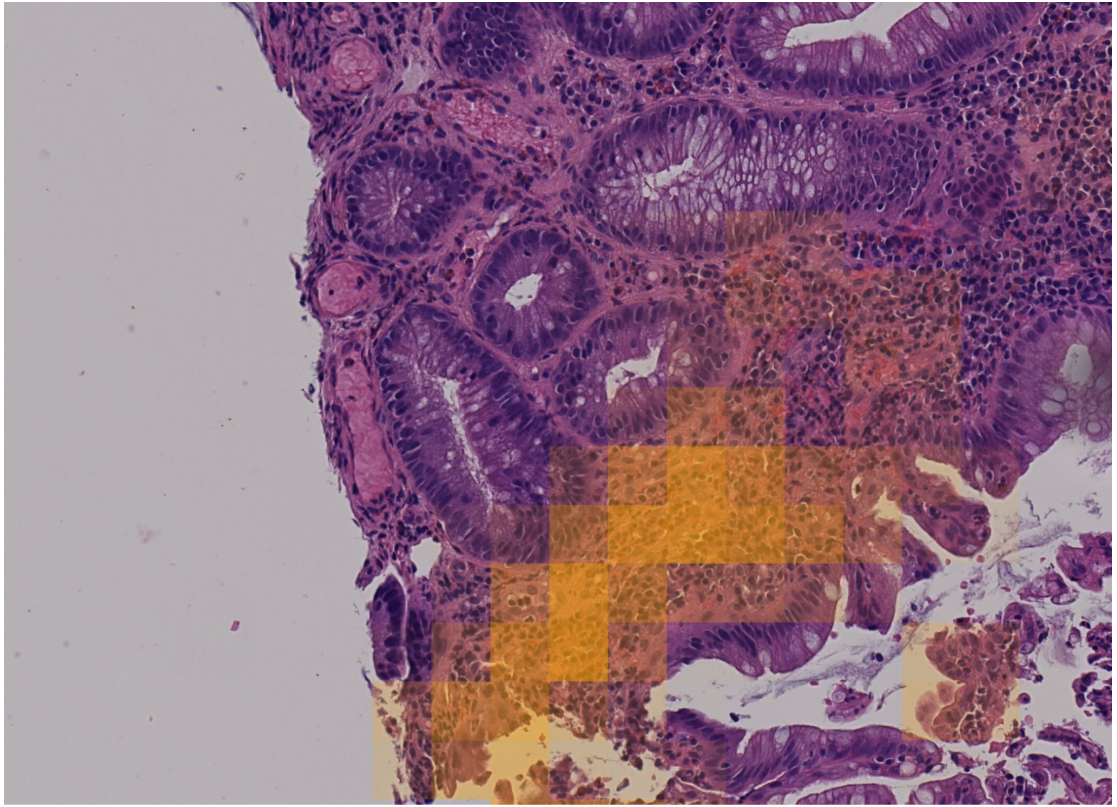
Results for all Nancy classes

accuracy	0.680
sensitivity	0.680
specificity	0.920



Example predictions





Example predictions