



CLIPath

CLIP for pathology images and reports

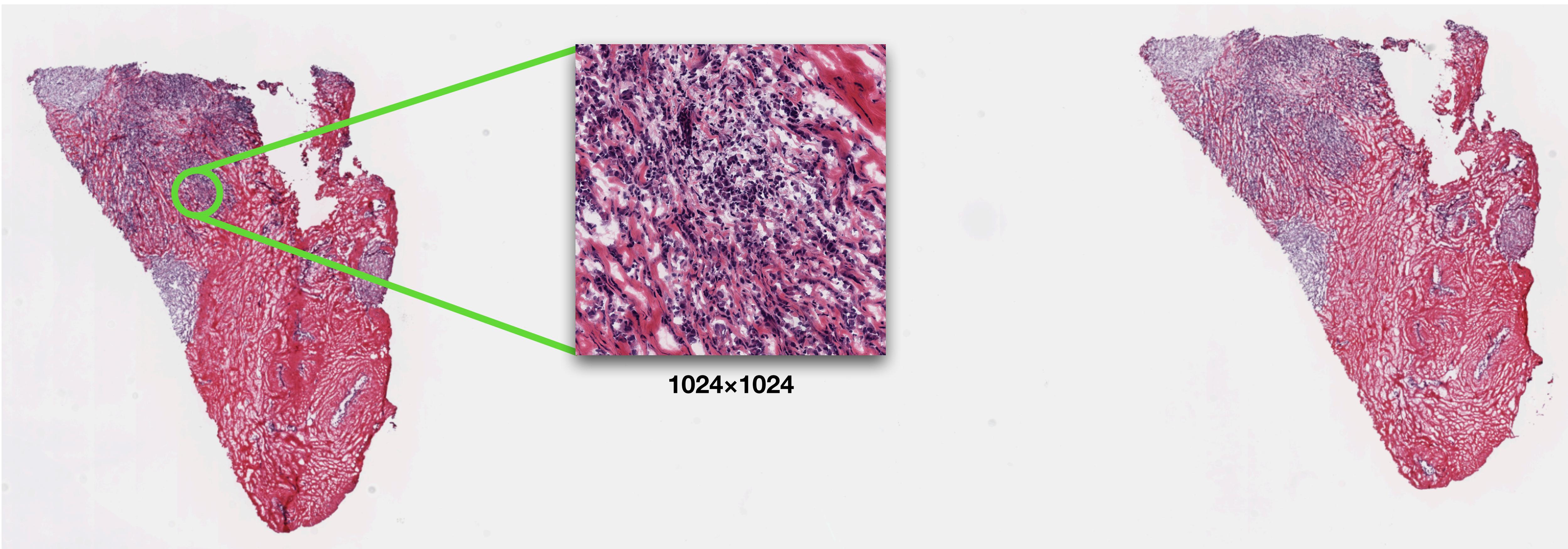
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Natural Language Processing course
Dr. Asgari

Sharif University of Technology
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Introduction

WSI (Whole Slide Image)



120K×40K

TCGA dataset [1]

Reports

FINAL DIAGNOSIS:

PART 1: LEFT BREAST, SEGMENTAL MASTECTOMY -

- A. INVASIVE DUCTAL CARCINOMA, NOTTINGHAM SCORE 8/9 (TUBULES 3, NUCLEI 3, MITOSIS 2), 2.6 CM.
- B. DUCTAL CARCINOMA IN SITU, MICROPAPILLARY AND SOLID TYPES WITH COMEDO NECROSIS, NUCLEAR GRADE 3, REPRESENTING 5% OF THE TUMOR VOLUME.
- C. LYMPHOVASCULAR SPACE INVOLVEMENT SEEN.
- D. INVASIVE CARCINOMA IS 0.1 CM FROM INFERIOR MARGIN.
- E. DUCTAL CARCINOMA IN SITU IS <0.1 CM (1MM) FROM INFERIOR MARGIN.
- F. MARGINS FREE OF LESION.
- G. MICROCALCIFICATION ASSOCIATED WITH BENIGN CHANGES AND TUMOR.
- H. CHANGES CONSISTENT WITH BIOPSY SITE.
- I. PROLIFERATIVE FIBROCYSTIC CHANGES WITH ATYPICAL DUCTAL EPITHELIAL HYPERPLASIA AND COLUMNAR CELL CHANGES.
- J. MICROSCOPIC PERIPHERAL PAPILLOMA AND SCLEROSING ADENOSIS.
- K. SKIN NOT REMARKABLE.

PART 2: LEFT AXILLA, SENTINEL LYMPH NODE #1, EXCISION -

- A. ONE LYMPH NODE POSITIVE FOR METASTATIC CARCINOMA (0.9 CM).
- B. NO EXTRACAPSULAR EXTENSION SEEN.

PART 3: LEFT AXILLA, SENTINEL LYMPH NODE #2, EXCISION -

ONE LYMPH NODE WITH RARE CLUSTERS OF METASTATIC TUMOR CELLS IN PERIPHERAL SINUS.

PART 4: LEFT AXILLA, LYMPH NODE EXCISION -

ONE LYMPH NODE WITH EXTENSIVE THERMAL EFFECT, PROBABLY FREE OF TUMOR.

CASE SYNOPSIS:

SYNOPTIC - PRIMARY INVASIVE CARCINOMA OF BREAST

LATERALITY:

Left

PROCEDURE:

Segmental

LOCATION:

Lower outer quadrant

SIZE OF TUMOR:

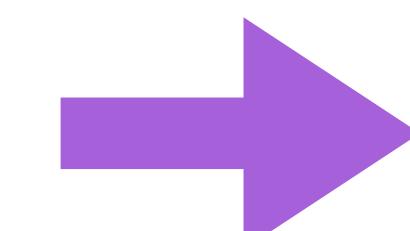
Maximum dimension invasive component: 2.6 cm

MULTICENTRICITY/MULTIFOCALITY OF INVASIVE FOCI:

No

TUMOR TYPE (Invasive component)

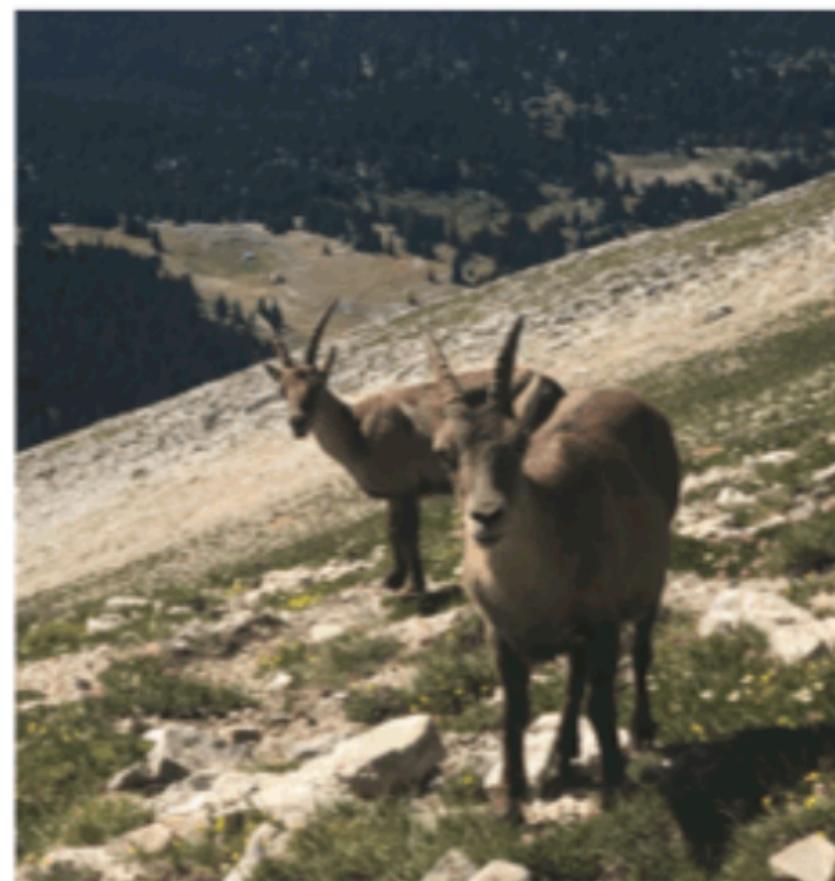
ICD-O-3
Carcinoma, infiltrating ductal, nos 8500/3
Site: breast, nos C50.9 3/3/11 hr



INVASIVE DUCTAL CARCINOMA,
DUCTAL CARCINOMA IN SITU,
MICROPAPILLARY AND SOLID
TYPES WITH COMEDO NECROSIS.
DUCTAL CARCINOMA IN SITU IS
NEAR INFERIOR MARGIN.

DINO

DINO

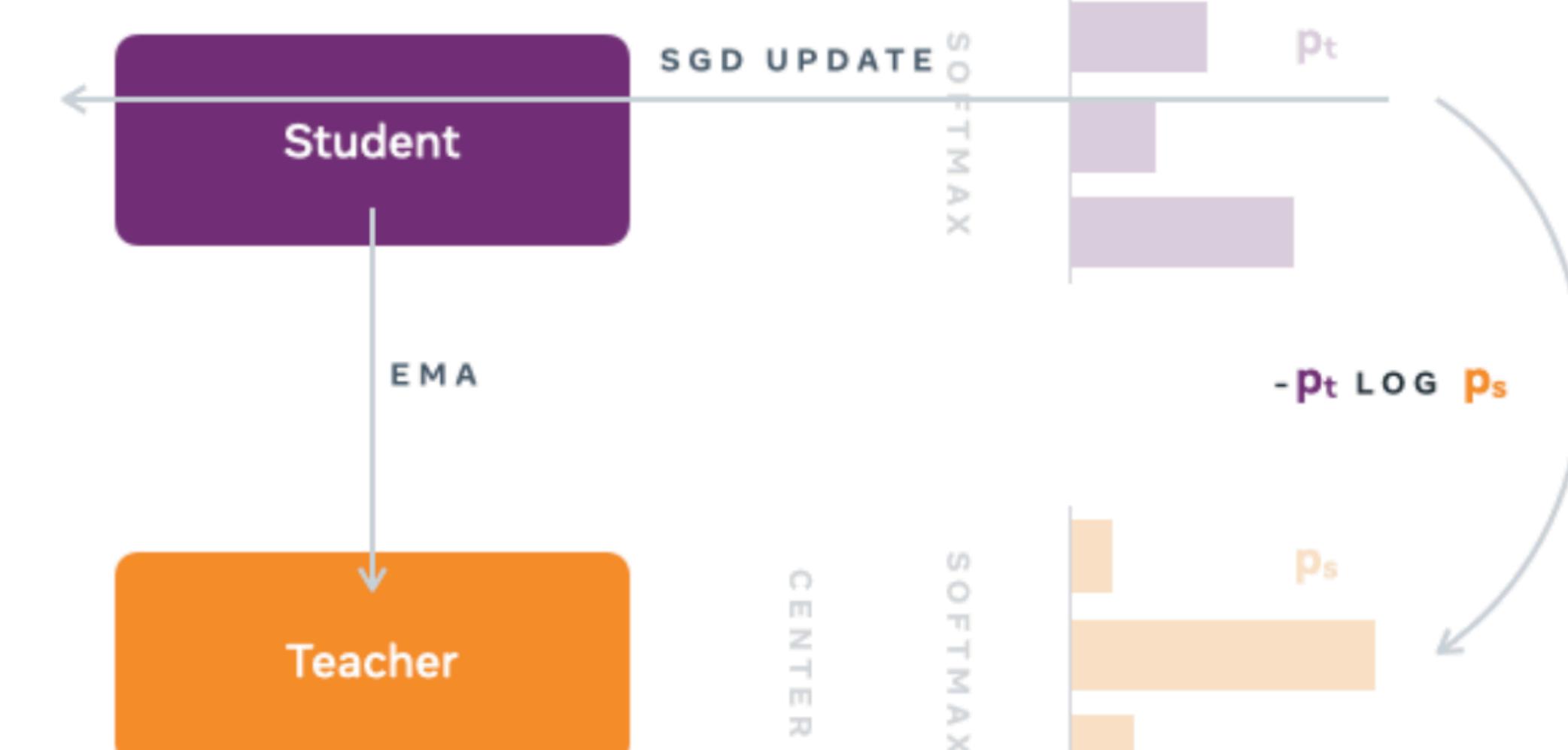


Student

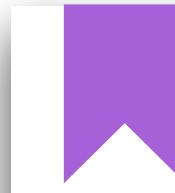
Teacher



DINO



Pathology BERT



PathologyBERT - Pre-trained Vs. A New Transformer Language Model for Pathology Domain

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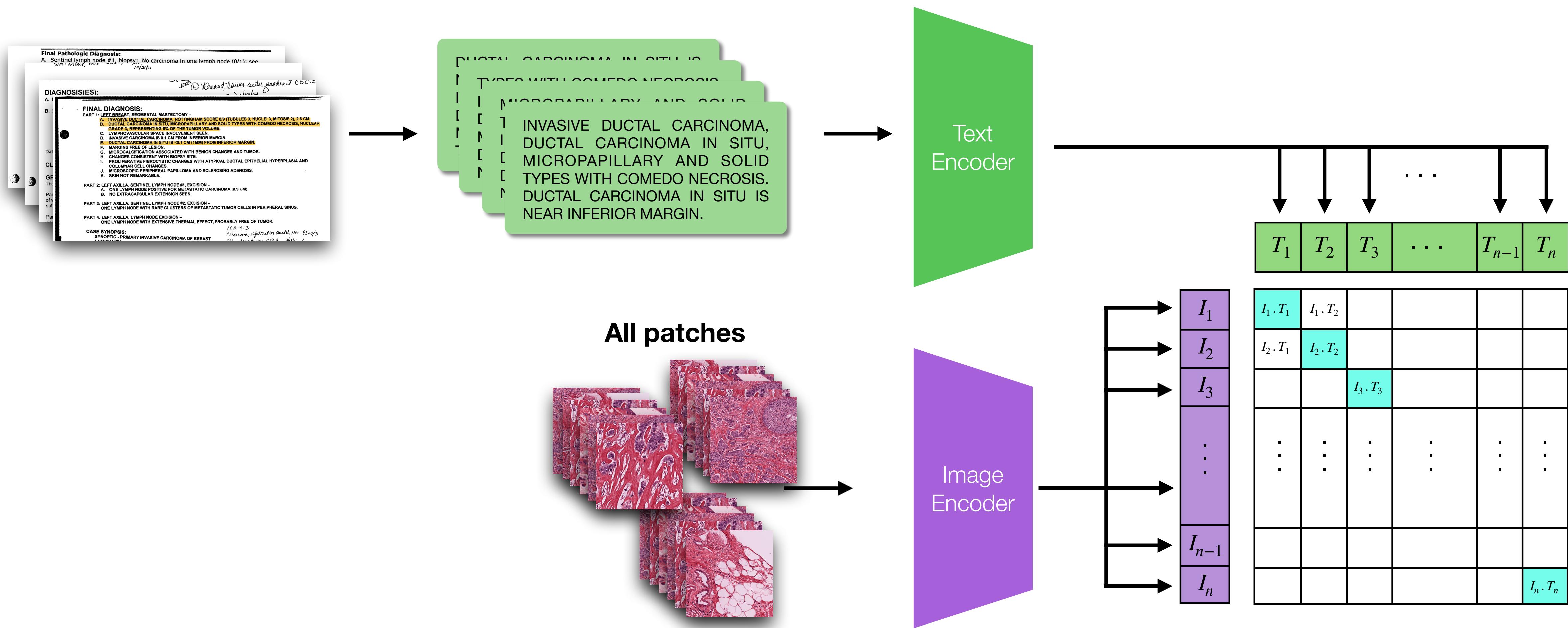
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Abstract Pathology text mining is a challenging task given the reporting variability and constant new findings in cancer sub-type definitions. However, successful text mining of a large pathology database can play a critical role to advance 'big data' cancer research like similarity-based treatment selection, case identification, prognostication, surveillance, clinical trial screening, risk stratification, and many others. While there is a growing interest in developing language models for more specific clinical domains, no pathology-specific language space exist to support the rapid data-mining development in pathology space. In literature, a few approaches fine-tuned general transformer models on specialized corpora while maintaining the original tokenizer, but in fields requiring specialized terminology, these models often fail to perform adequately. We propose PathologyBERT - a pre-trained masked language model which was trained on 347,173 histopathology specimen reports and publicly released in the Huggingface repository. Our comprehensive experiments demonstrate that pre-training of transformer model on pathology corpora yields performance improvements on Natural Language Understanding (NLU) and Breast Cancer Diagnose Classification when compared to nonspecific language models.

A bert model generates diagnostically relevant semantic embeddings from pathology synopses with active learning (PathologyBERT) [2]

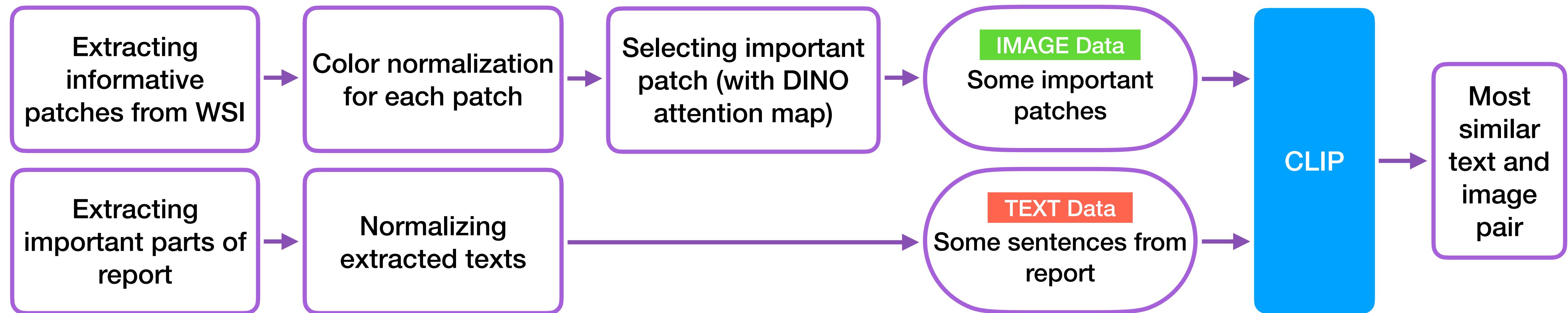
Baseline

Baseline model

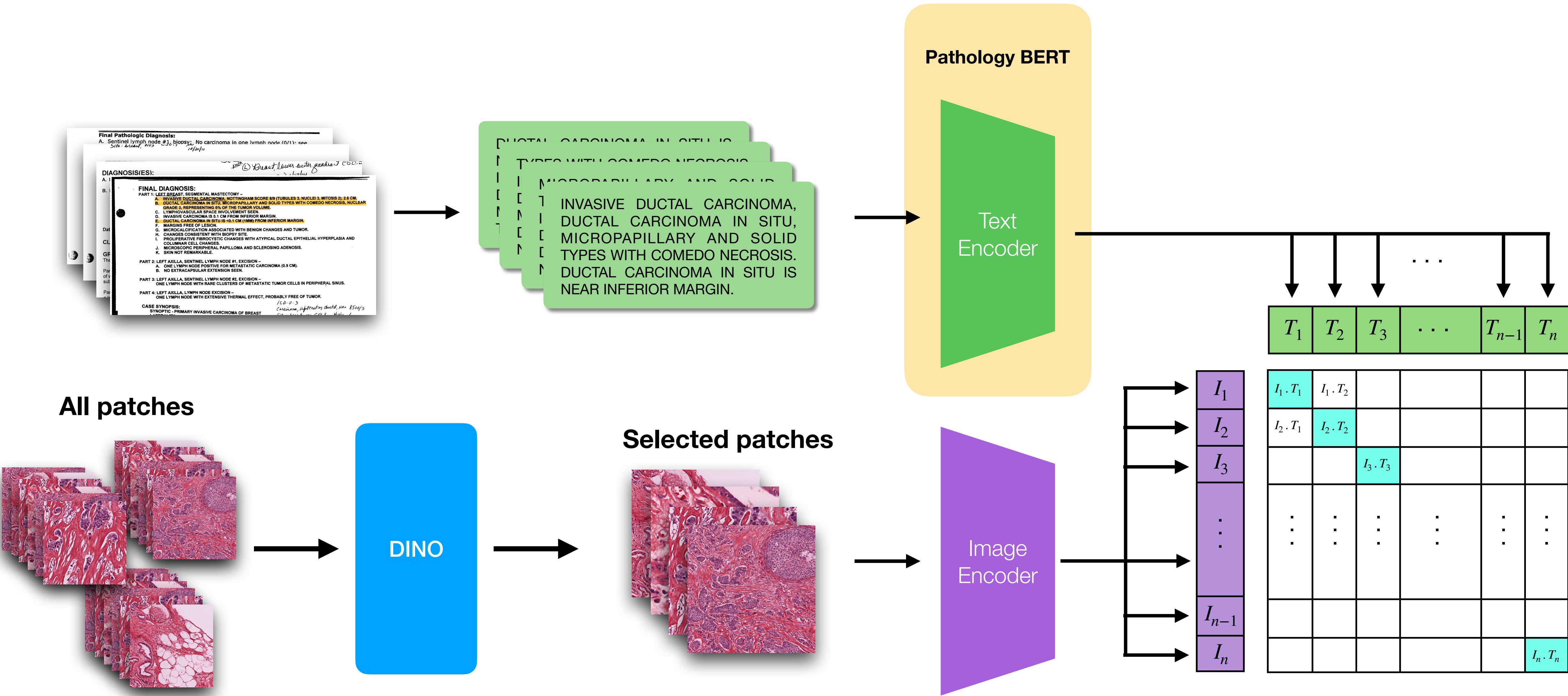


Proposed Model

Pipeline



Proposed model



Results

Discussion

References

References

- [1] National Cancer Institute 2023, The Cancer Genome Atlas Program (TCGA), accessed 9 March 2023, <https://www.cancer.gov/about-nci/organization/ccg/research/structural-genomics/tcga>
- [2] Mu, Y., Tizhoosh, H. R., Tayebi, R. M., Ross, C., Sur, M., Leber, B., & Campbell, C. J. (2021). A bert model generates diagnostically relevant semantic embeddings from pathology synopses with active learning. *Communications Medicine*, 1(1), 11.
- [3] Caron, M., Touvron, H., Misra, I., Jégou, H., Mairal, J., Bojanowski, P., & Joulin, A. (2021). Emerging properties in self-supervised vision transformers. In *Proceedings of the IEEE/CVF international conference on computer vision* (pp. 9650-9660).

Thank For
Your
Attention :)