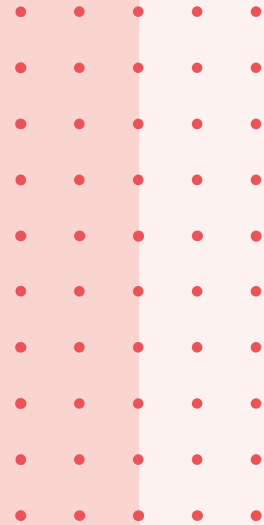# Gynecological Cytology Screening with Artificial Intelligence

Lara Castanheira

Anatomical Pathology

Macroscopy

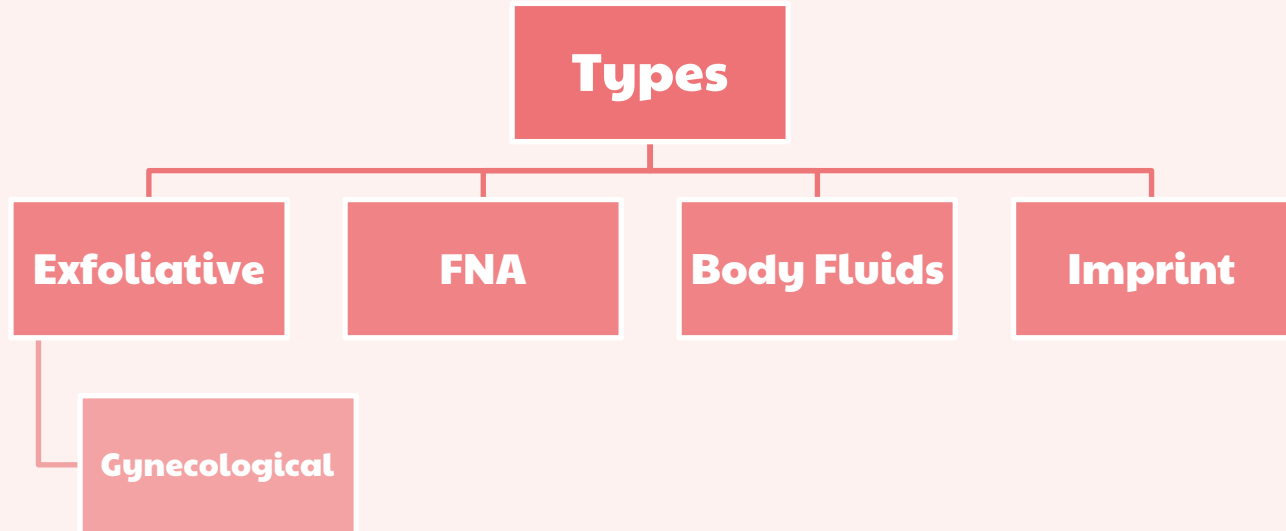Cytology

Histopathology

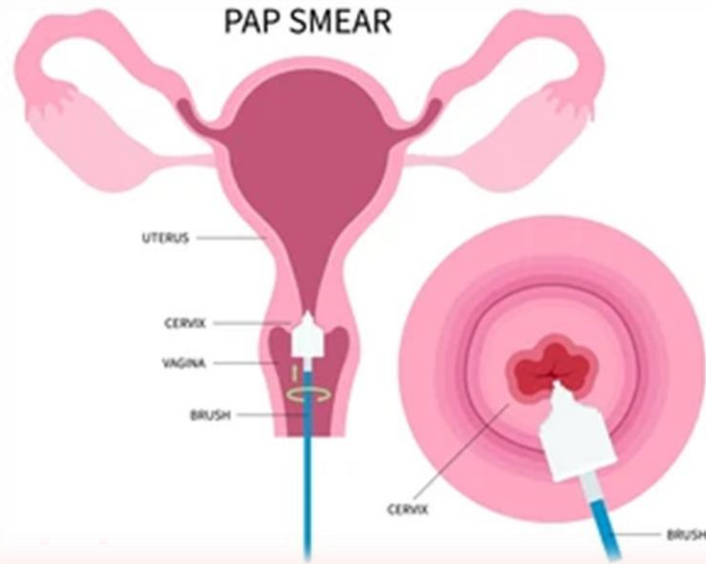Immunohistochemstry

Autopsy

Cytology

- morphological study of cells

```
                          ┌──────────────┐
                          │    Types     │
                          └──────┬───────┘
          ┌──────────────┬───────┴───────┬──────────────┐
   ┌──────────────┐ ┌──────────┐ ┌──────────────┐ ┌──────────┐
   │  Exfoliative │ │   FNA    │ │ Body Fluids  │ │ Imprint  │
   └──────┬───────┘ └──────────┘ └──────────────┘ └──────────┘
          │
   ┌──────────────┐
   │ Gynecological│
   └──────────────┘
```
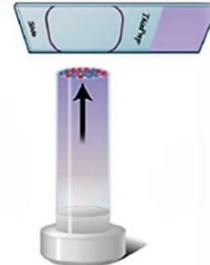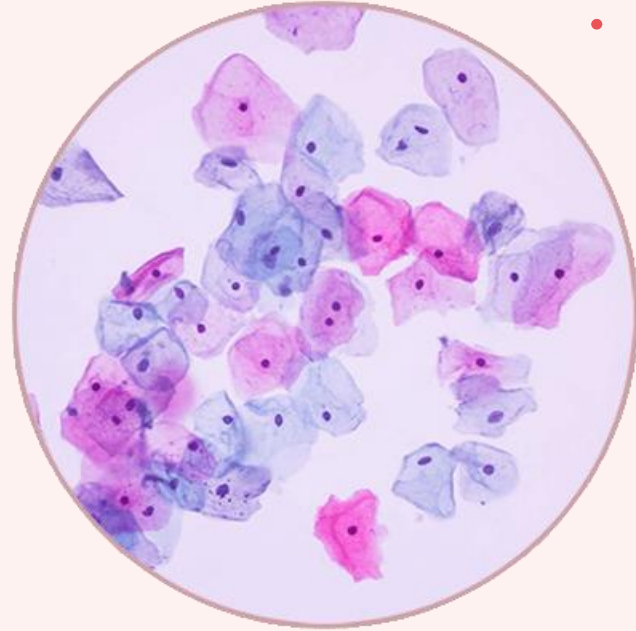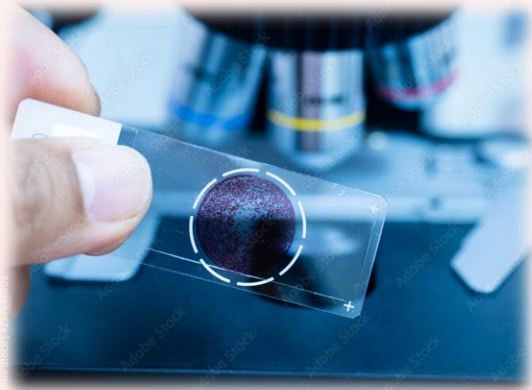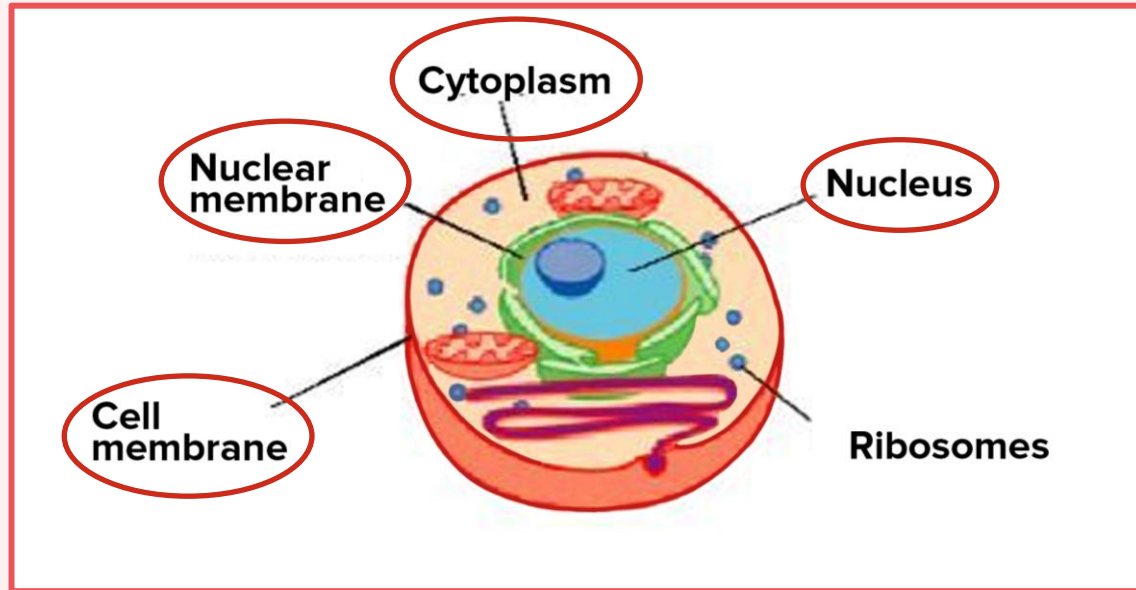
Sample Collection

Sample Processing

Thinprep

Dispersion   Collection   Transfer

Papanicolaou Staining
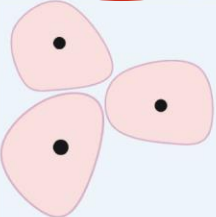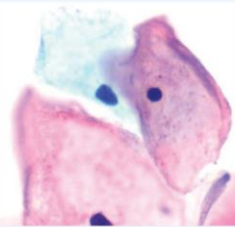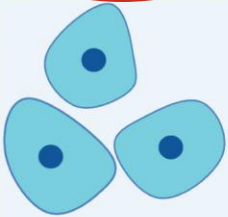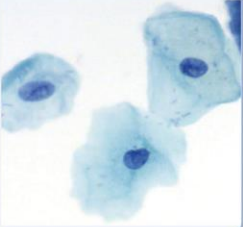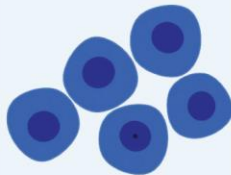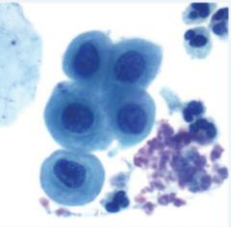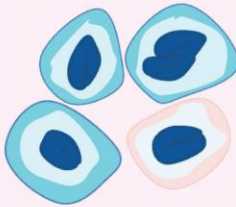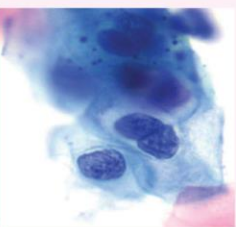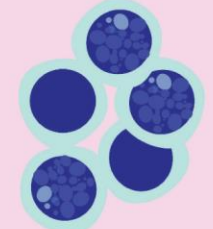
Cell – Basic Structure

Cervix Cell Types
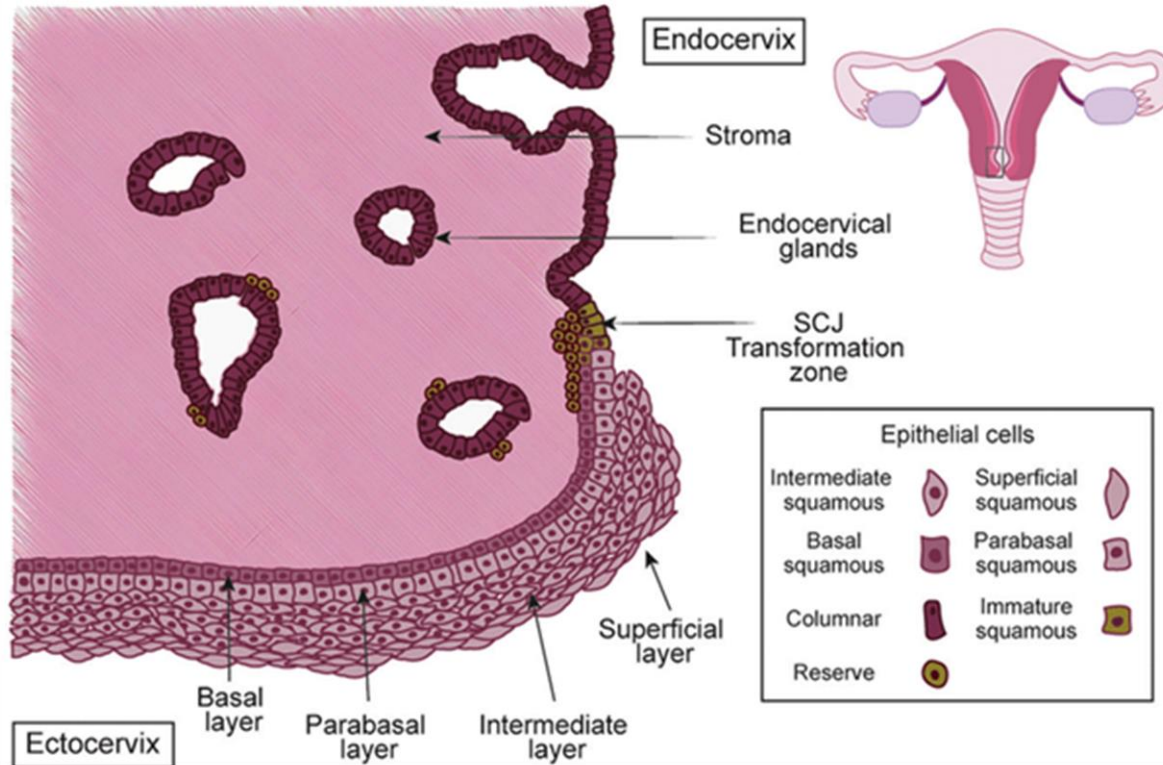
Cell Types – Bethesda System

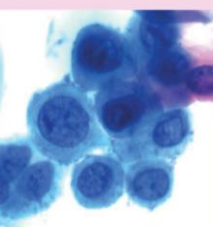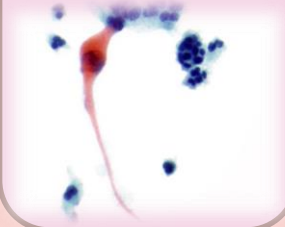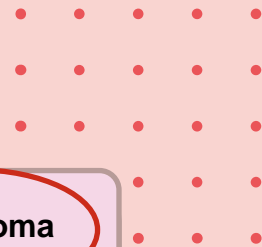| Superficial	Intermediate	Parabasal / metaplastic cells	LSIL	HSIL	Carcinoma
• Cross sectional necular area: ± 15 μm³	• Used as a yard stick for nuclear size. • Cross sectional necular area: ± 35 μm3	• In Atrophic cases, PBC may be seen as HCG. • In some cases they may mimic HSIL, but they have regular oval to round nuclei with fine chromatin and subtle nucleolus.	• Low N/C • Nuclear size > 3 X ICN • Nuclear irregularity • Hyperchromasia • Perinuclear halo • Binucleation	• High N/C ratio • Nuclear size is varibale • Hyperchromasia	• Variations in cell size and shape, high N/C ratio • Nucleus Hyperchromatic, irregular, pleomorphic • Keratinization and dyskeratosis • Presence of necrosis and inflammation • Cell Arrangements: Disorganized clusters and single cells

Diagnosis prediction based on images

109 images

4 classes:
Normal - 164
LSIL - 145
HSIL - 135
Carcinoma - 71

Train -70%
Test – 20%
Validation -10%

Dataset

Labbeling

YOLO

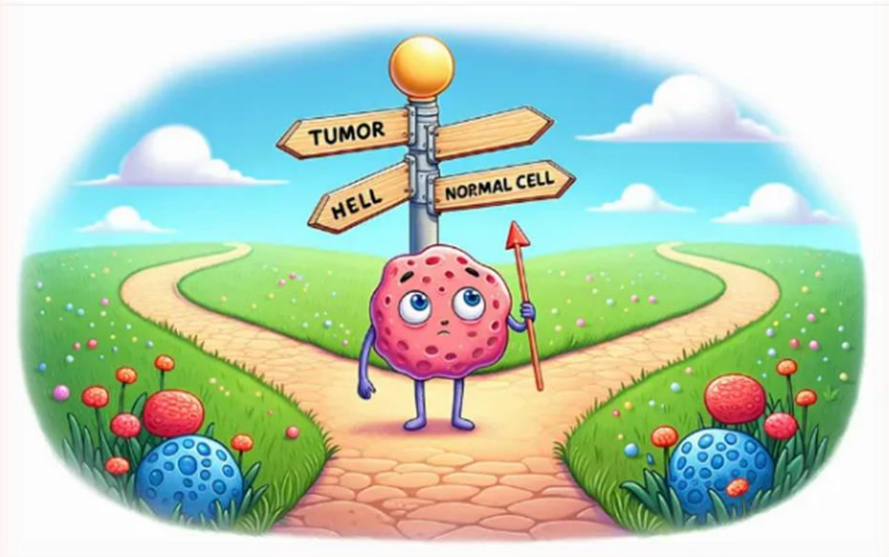Precision: 0.72

Recall: 0.67
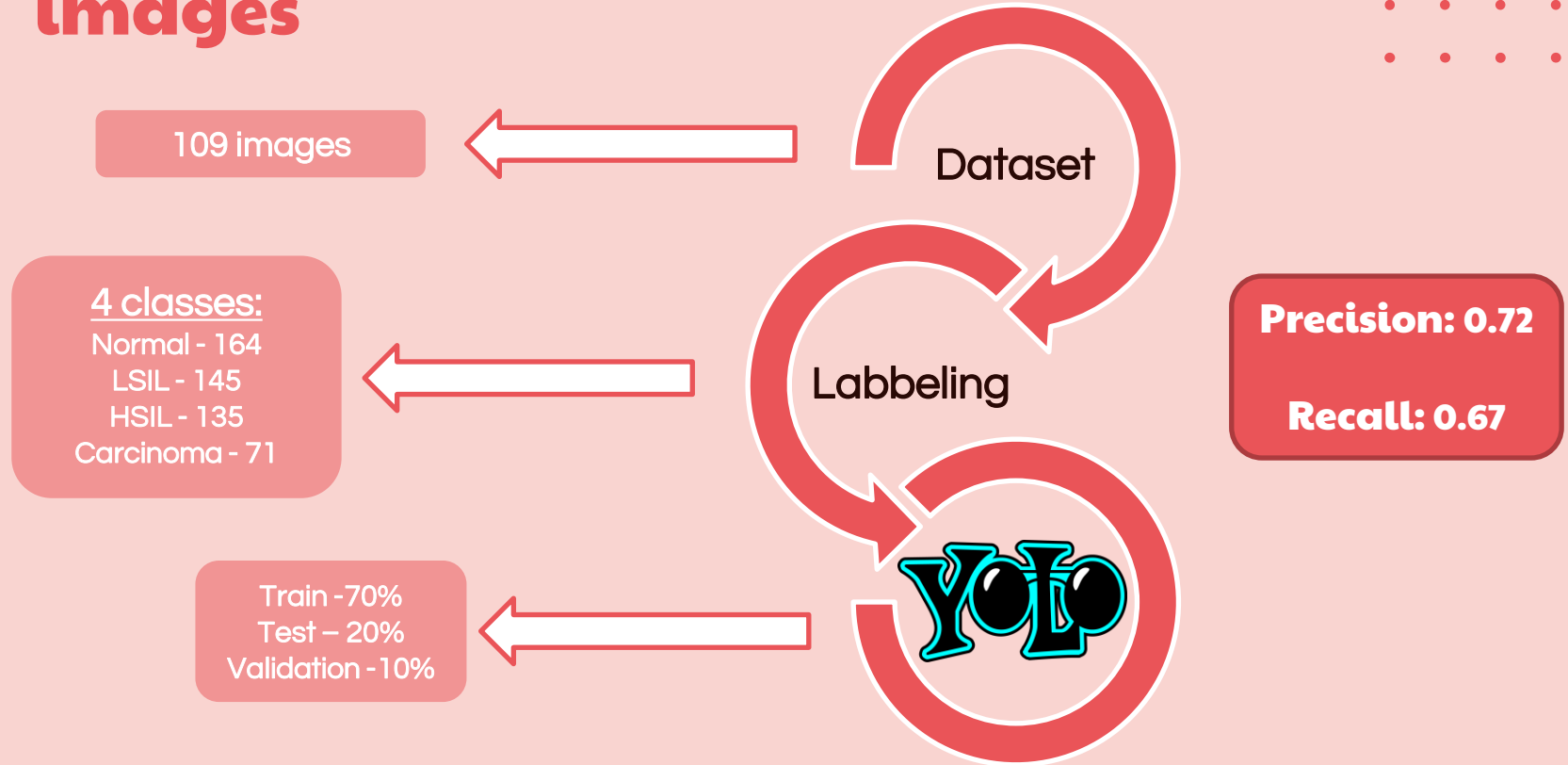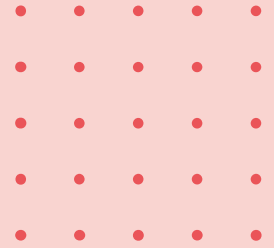
Gynecological Cytology App

link

Next steps

o increase the size of the dataset

o include more cell classes

o include more normal cells

o divide normal cells into superficial and intermediate cells

o try another version of the YOLO model

o try to improve the model's metrics

Bibliography

o   The Bethesda System for reporting cervical cytology – 3rd Edition

o   Pathology Outlines - Bethesda system

o   Squamous intraepithelial lesions (SIL: LSIL, HSIL, ASCUS, ASC-H, LSIL-H) of Uterine Cervix and Bethesda System - CytoJournal

Thank you!