Gynecological Cytology Screening with Artificial Intelligence

Lara Castanheira

Anatomical Pathology

Macroscopy

Cytology

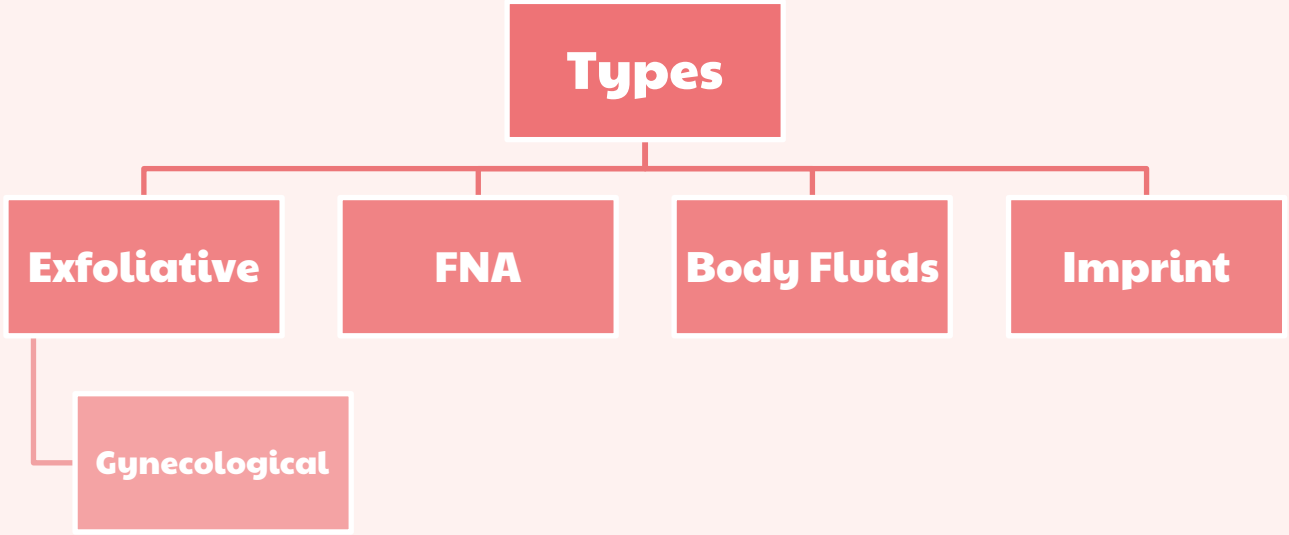
Histopathology

Immunohistochemstry

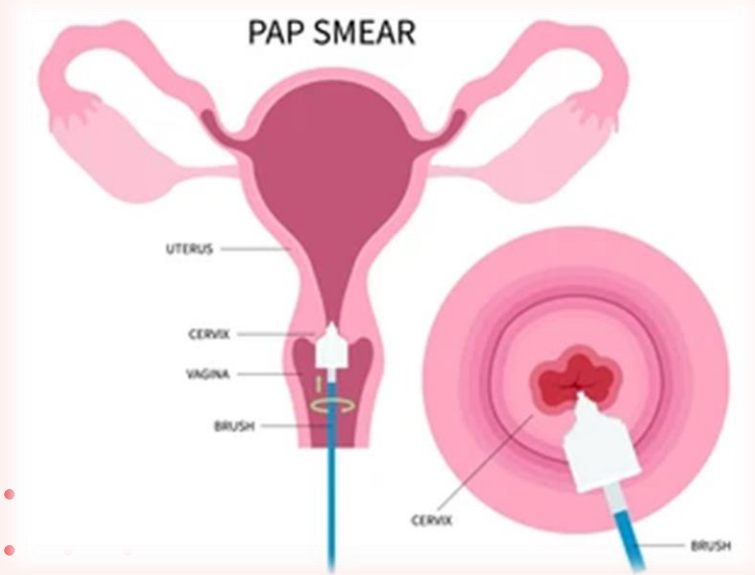
Autopsy

Cytology

- morphological study of cells



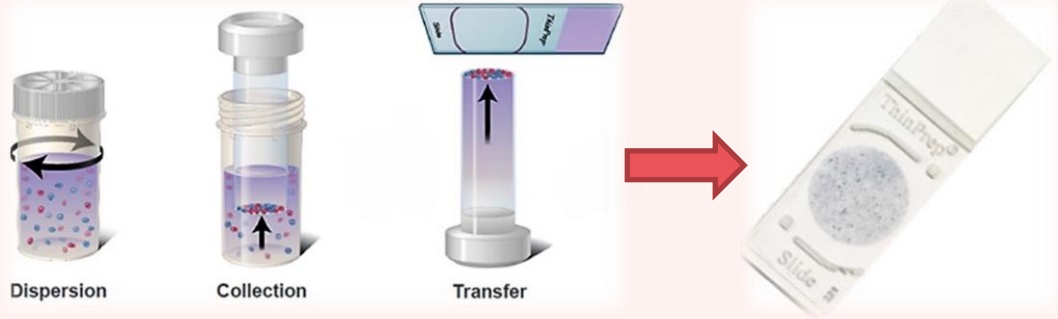
Sample Collection



Sources: The Pap test for cervical cancer screening – Gyntect
ThinPrep® Processors | Hologic

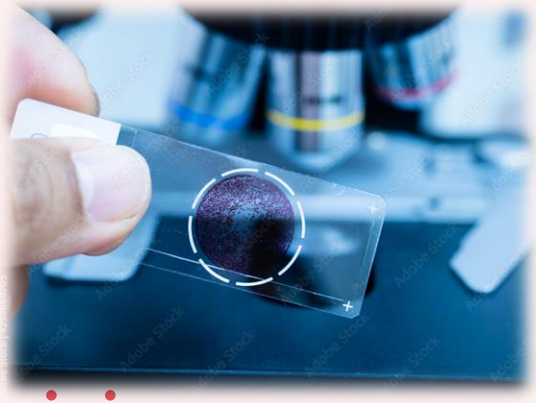
Sample Processing

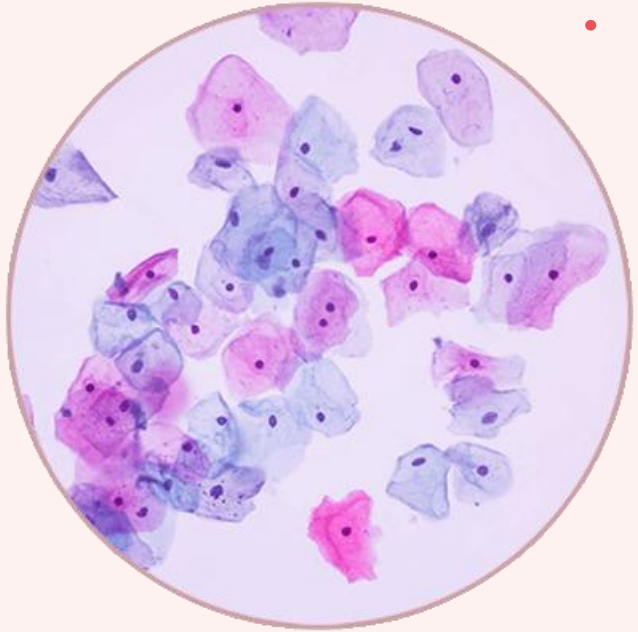
Thinprep



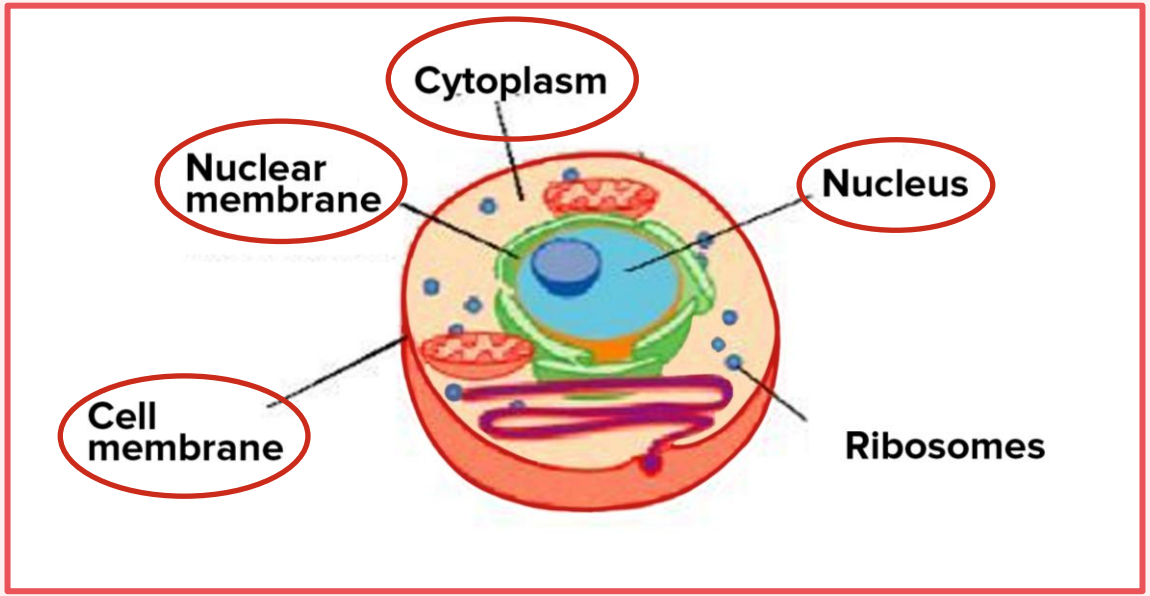
Source: ThinPrep® Processors | Hologic

Papanicolaou Staining



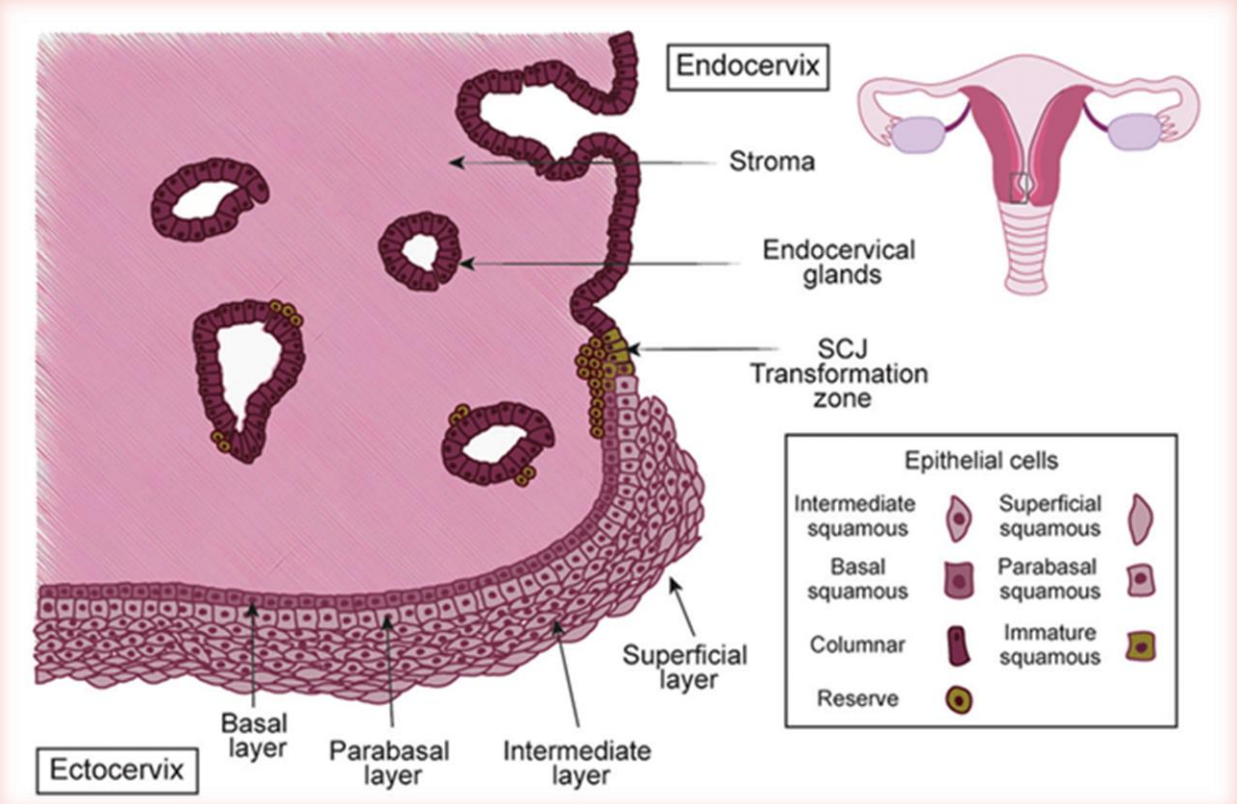


Cell – Basic Structure



Source: Cell Structure and Function Part 1 – The Organelles - Medical Exam Prep

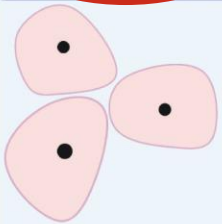
Cervix Cell Types



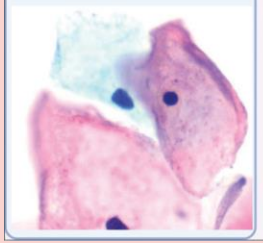
Source: The anatomy of the human cervix. The cervix consists of two distinct... | Download Scientific Diagram (researchgate.net)

Cell Types – Bethesda System

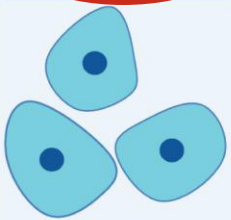
Superficial



• Cross sectional necular area: ± 15 µm³

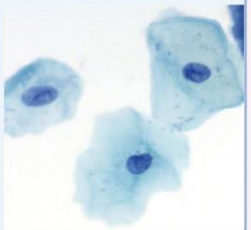


Intermediate



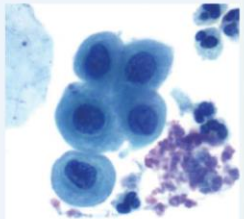
• Used as a yard stick for nuclear size.

• Cross sectional necular area: ± 35 µm3

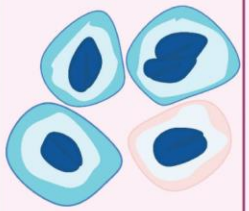


Parabasal / metaplastic cells

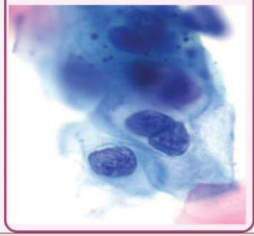
• In Atrophic cases, PBC may be seen as HCG.
• In some cases they may mimic HSIL, but they have regular oval to round nuclei with fine chromatin and subtle nucleolus.



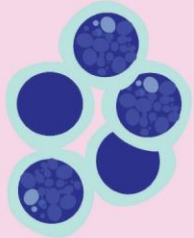
LSIL



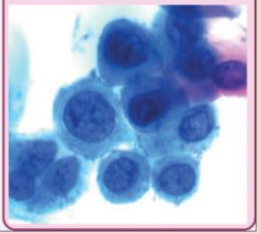
• Low N/C
• Nuclear size > 3 X ICN
• Nuclear irregularity
• Hyperchromasia
• Perinuclear halo
• Binucleation



HSIL

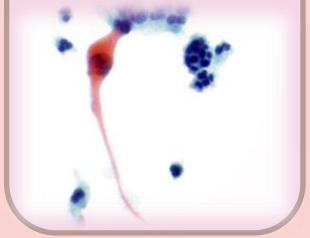


• High N/C ratio
• Nuclear size is varibale
•Hyperchromasia



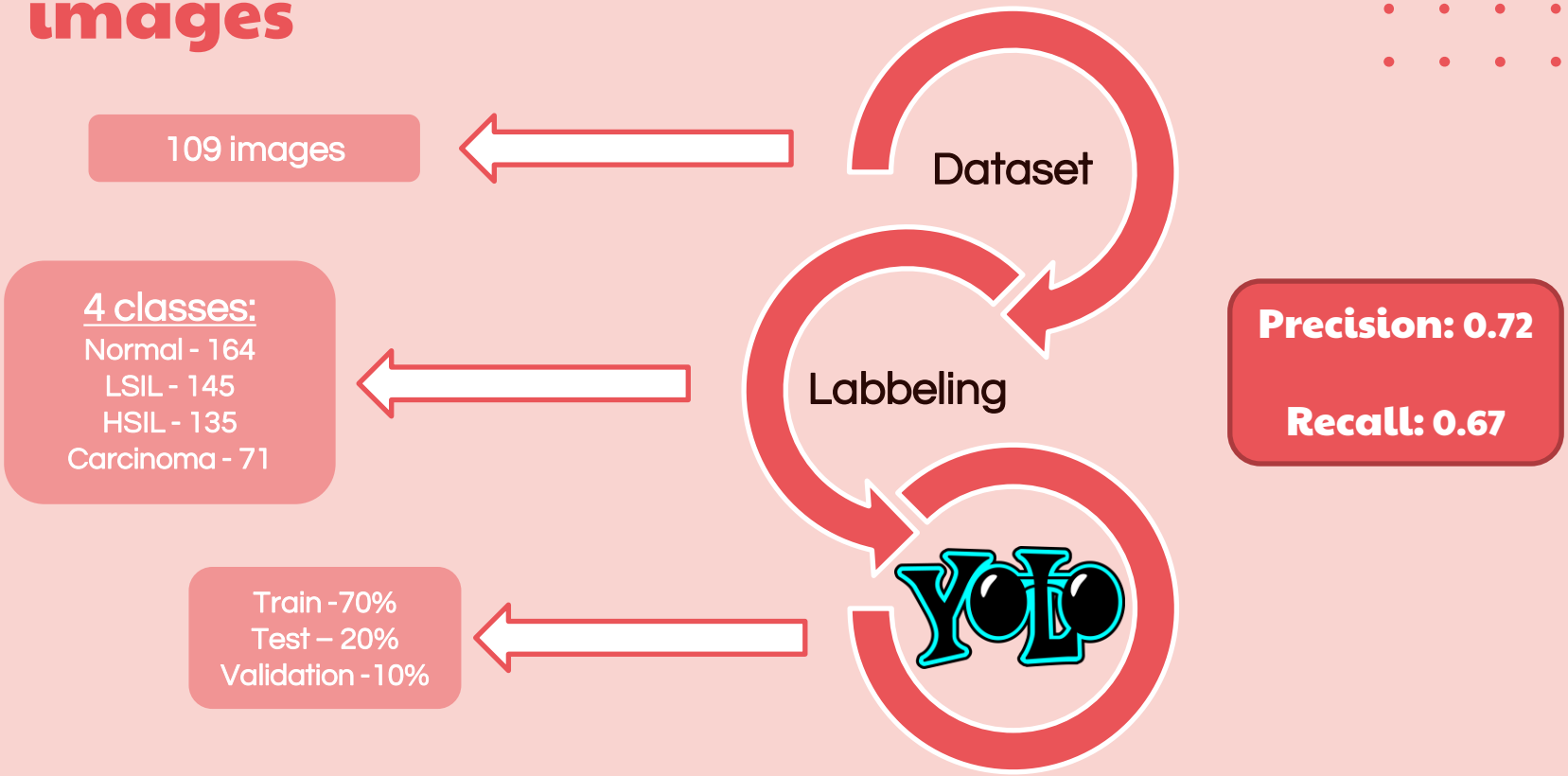
Carcinoma

• 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



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

Diagnosis prediction based on images



Gynecological Cytology App

link

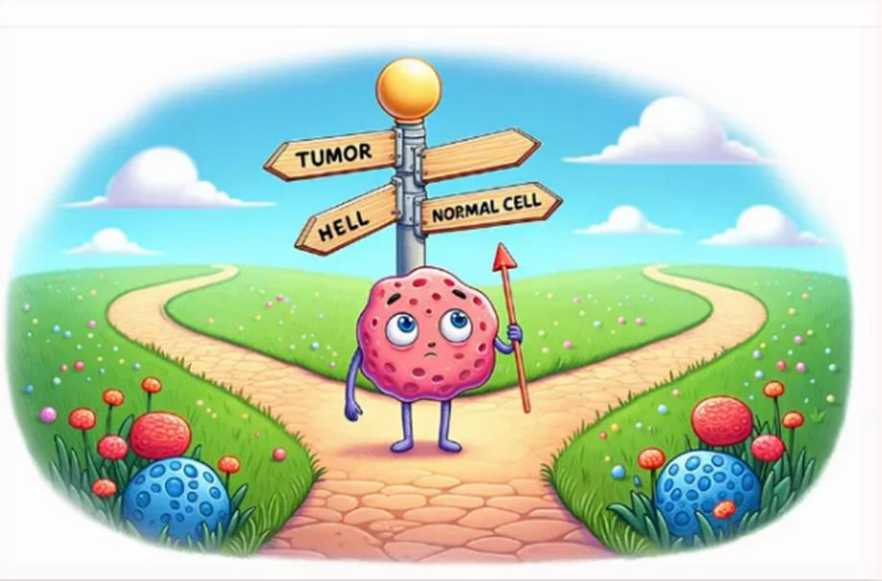
Next steps

- increase the size of the dataset
- include more cell classes
- include more normal cells
- divide normal cells into superficial and intermediate cells
- try another version of the YOLO model

- try to improve the model's metrics

Bibliography

- The Bethesda System for reporting cervical cytology – 3rd Edition
- Pathology Outlines - Bethesda system
- Squamous intraepithelial lesions (SIL: LSIL, HSIL, ASCUS, ASC-H, LSIL-H) of Uterine Cervix and Bethesda System - CytoJournal



Thank you!