tribun

THE FUTURE OF CYTOLOGY: A NEW WAY OF WORKING BASED ON AI

Dr. Rutger H.J. Fick Tribun Health

Symposium voor Pathologie 16 December 2022

TRIBUN HEALTH

Why partner with us.

■ INTEGRATED PLATFORM

CONTINENTS EU + US

Г

YEARS IN PATHOLOGY

40+ EXPERTS 2004 LABORATORIES NETWORK



Advantages & Costs of digitalized

workflow

AI and digitalization are separate concepts :

- AI requires digitalized pathology labs, but <u>digitalized pathology labs don't</u> <u>require AI</u>.
- Digitalization has its own benefits and started in the beginning of 2010.





Lujan, Giovanni, et al. "Dissecting the business case for adoption and implementation of digital pathology: A white paper from the digital pathology association." Journal of Pathology Informatics 12.1 (2021): 17.

The necessity of AI in digitalization

Current trends show we may not even have a choice but to go digital.





Lujan, Giovanni, et al. "Dissecting the business case for adoption and implementation of digital pathology: A white paper from the digital pathology association." Journal of Pathology Informatics 12.1 (2021): 17.

CERVICAL CANCER SCREENING BY TRIBUN



Overview of the Presentation

- Current cytology workflow and cytology-specific pain points
- Proposed AI-supported workflow
- What is the data? What are the difficulties?
- (briefly) AI-Algorithm approach
- Demo

Cytology Workflow





Painpoint: Finding the Needle in Haystack



Between 80-150 cases per day. High inter-observer variability.



Analysis Pipeline of Cytology Images



Based on Bethesda System



Deep Learning Based Cervical Cytology





Inférence and testing





Cytology: Many Object Classes of Intere











High Grade Cells:

ASCH

- HSIL: High-grade squamous intra-epithelial lesions \bullet
- ASCH: Atypical squamous cells-cannot exclude high-grade squamous intra-epithelial lesion
- CA: Squamous Cell Carcinoma







pathway





Low Grade Cells:

- LSIL: High-grade squamous intra-epithelial lesions
- ASCUS: atypical squamous cells of undetermined significance



pathway





Atypical Glandular Cells:

- AGC: Atypical Glandular Cells
- AIS: Adenocarcinoma in situ



AIS



GV

pathway





- HER: Herpes
- ACT: Actinomycose
- MYC: Mycose
- TV: Trichomonas Vaginalis
- GV: Gardnerella Vaginalis













AI-Detection Challenge: Unbalanced Object Class

Representation Object classes are unbalanced due to rarity of occurrence in data

- Glandular Normal Cell (GNC) very frequent.
- Other classes relatively rare to spot.
- Object grouping by clinical pathway mitigates class sparsity









AI-Detection Challenge: Inter-class similarity

Classes can be very similar in morphology.

Example: HERPES versus HSIL cells can appear very similar in certain conditions.





Standardization Challenge: GV vs normal

cell

GNC not detected.



Thinprep: More "grainy" images Causes False GV Detection False Gardnerella Vaginalis (GV) detection.



Surepath (BD)

GV cell around normal cells.



AI-Detection Approach: 2-stage Detector



Sohail, Anabia, et al. "A multi-phase deep CNN based mitosis detection framework for breast cancer histopathological images." Scientific Reports 11.1 (2021): 1-18.

Demo with e-calopix

- Show the gallery and how to go through detected objects.
- Viewer with multi-class support scheduled for early 2023







Main Takeaways

With respect to robust AI-supported cytology model development:

- Respect how hard the problem is.
- Dataset size and heterogeneity are essential to get robust results.
- Multi-annotator (at least 2+1) is important to reduce label noise.

With respect to Tribun's envisioned workflow support:

- Tribun supports both the cytology and histology workflow. Flexible solution for both cytology and histology.
- Generalizable to different scanners.
- Ability to absorb the loss of manpower through AI-efficient solutions.

A platform prepared for future trends:

• Expectation for a reduction in cytological slides due to the implementation of primary HPV testing.





Main Takeaways

With respect to robust AI-supported cytology model development:

- Respect how hard the problem is.
- Dataset size and heterogeneity are essential to get robust results.
- Multi-annotator (at least 2+1) is important to reduce label noise.

With respect to Tribun's envisioned workflow support:

- Tribun supports both the cytology and histology workflow. Flexible solution for both cytology and histology.
- Generalizable to different scanners.
- Ability to absorb the loss of manpower through AI-efficient solutions.

A platform prepared for future trends:

• Expectation for a reduction in cytological slides due to the implementation of primary HPV testing.



Main Takeaways

With respect to robust AI-supported cytology model development:

- Respect how hard the problem is.
- Dataset size and heterogeneity are essential to get robust results.
- Multi-annotator (at least 2+1) is important to reduce label noise.

With respect to Tribun's envisioned workflow support:

- Tribun supports both the cytology and histology workflow. Flexible solution for both cytology and histology.
- Generalizable to different scanners.
- Ability to absorb the loss of manpower through AI-efficient solutions.

A platform prepared for future trends:

• Expectation for a reduction in cytological slides due to the implementation of primary HPV testing.







Thank You for your attention! We are hiring and/or open to collaborate! \odot Contact me at rfick@tribun.health or HR Director Julie Rat jrat@tribun.health