

When AI meets Computational Pathology

Companion test, translational projects and data challenges

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LIPADE: Nicolas Loménie, Camille Kurtz, Foula Vagena, Research Assistant

POCHI
1) in collaboration with Gulian advance the POCHI project: improvement of annotation process (cytomine) and of the density estimation with NoROI taken into account (C++ DigiCompanion Software + python script for the curves): Image analysis
2) in collaboration with Qinghe with her next project: Julien has a lot of WSI with annotations that may be used for other topics on other tissues like liver disease: transfer learning
3) Study of deep learning transfer model for the POCHI WSI out of the learned models in the MONDOR project
4) Study of HPV cancer and specific staining

MONDOR
Julien Calderero PUPH
Qinghe Ph.D.
Christophe Klein Research Engineer

Team:
JF Emile PUPH
Gulian Intern: Certification aspect, Cytomine.coop, Relationship
Mohamed Intern: Back and Front office aspects
Zhuxian Intern
Qinghe Ph.D.
Christophe Klein Research Engineer

Can we skip the IHC process ?

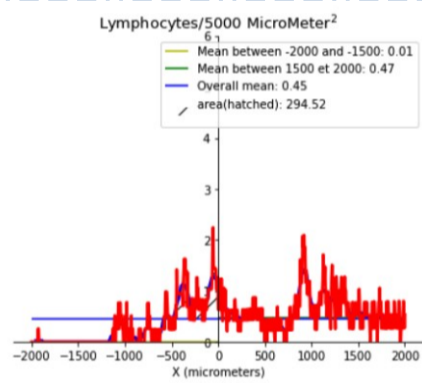
Current project, 250 annotated colon WSI stained with IHC (thousands of small patches for deep learning by WSI)
→ lymphocytes / specific proteins like Ki67 appear in **brownish**

Alcohol and tobacco

Higher risk diseases from human papilloma virus (HPV)

Less risk diseases from human papilloma virus (HPV)

Incident of head and neck cancer
World: 500 000/year
US: 38 500/year
France: 16 000/year
Mostly squamous cell carcinoma



By-product issue:
How to classify time series-like data into 4 type of infiltration based on:
- rule system by the pathologist
- online learning ?

Data Challenges, more to come

<https://www.drivendata.org/competitions/67/competition-cervical-biopsy/>

DRIVENDATA

TissueNet: Detect Lesions in Cervical Biopsies

Woohoo! This competition has come to a close!

Quick Facts

- PARTICIPANTS: 547
- NO. OF FILES: 613
- PRIZE: €25,000

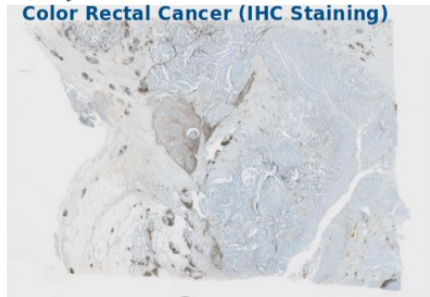
A Companion Test

POCHI Project - Collaboration with PUPH JF. Emile - Hôpital Ambroise Paré

- Colorectal Cancer
- IHC Staining
- Cytomine
- Semi-Automatic (IHC certification)

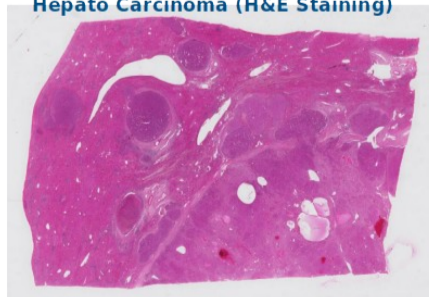
Can we learn the tumoral front independently of tissue / staining etc. ?

POCHI Project
With JF Emile (APHP Ambroise Paré)
Color Rectal Cancer (IHC Staining)



Immunohistochemistry Stain
69632pixels x 48384pixels, 9.41 GB uncompressed

MONDOR Project
With Julien Calderero
Hepato Carcinoma (H&E Staining)



Stained with Hematoxylin and Eosin Stain (HES)
59520pixels x 41216pixels, 6.85 GB uncompressed

Can we link the phenotype to the genotype ? (PhD thesis Qinghe Zeng - Mondor Project)

MONDOR

Colorectal cancer

Unsupervised learning on TCGA

Weakly Supervised learning

H&E

Cluster High: 14 tumors
Cluster Median + Low: 141 tumors

Part A Part B

Gene expression profile matrix

Heatmap

WSI Labelling

Patch extraction

deep learning model

Output class

Immune
non Immune