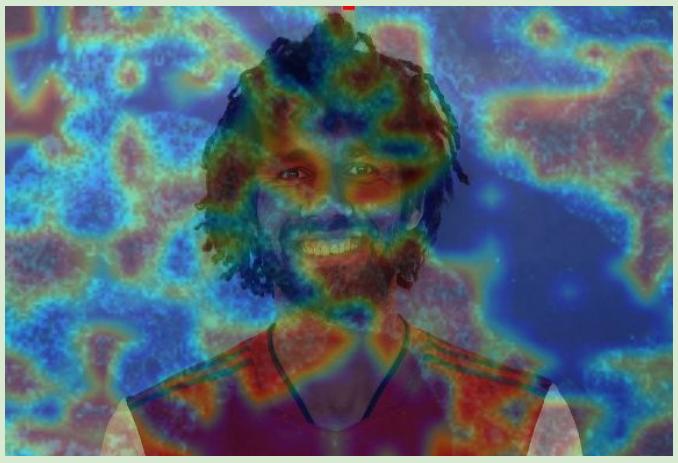
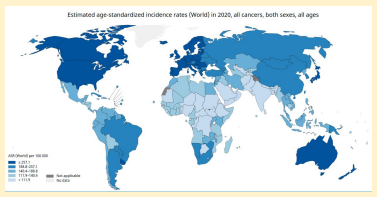


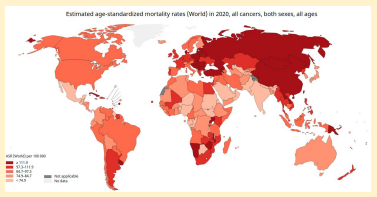
ORLian:

A novel method to help predict survival from HPV-induced oral cancer, by training mutli-modal interpretable convolutional network based on siamese similarity pretraining model with anonymised patient pathology data and other histological data

Introduction

While people still are worrying about waves of Covid-19 cases, tsunamis of cancer cases globally are worrying.





Total incidence 2020 est Total mortality

Incidence and mortality maps from https://gco.iarc.fr/

Ear Nose and Throat (ENT) cancers caused by Human Papilloma virus (HPV) spread as a sexually transmitted disease, and we need better tools to prevent mortality in patients & database access for open science.

Artificial intelligence may help.

Methods

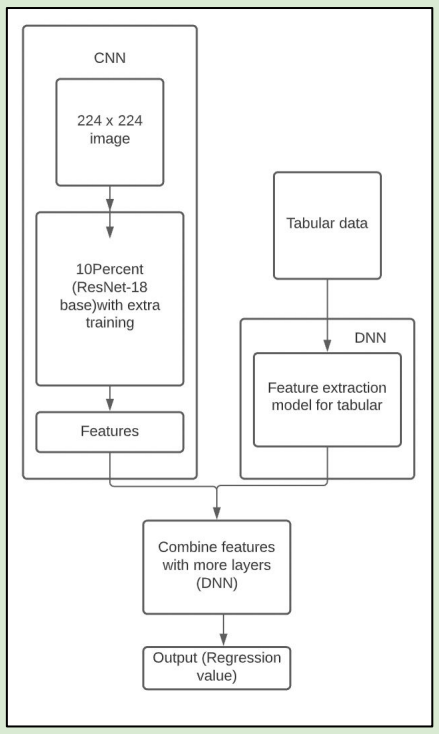
Histological sections from biopsies were used to train the EI-nAI-ny model, based on a pre-trained Res-Net*, then visualized using GRAD-CAM **

Training was done using data stored on Dataiku and generated images were compared back against image stack analyses

Evaluation Methods

Model evaluation was done using two methods:

1) Using XGBoost and SHAP to determine feature importance from the tabular
2) Use Leave One Out to remove one marker feature at a time and checking performance
   a) Medical expertise evaluate the model and rank their layers too



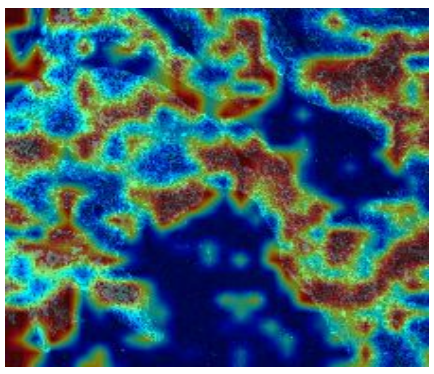
Model architecture

Results

Current Score on Macro: 5.766

Model outperforms many publicly available models such as ResNet-18

Can capture cellular structure in images better than original baselines



GRAD-CAM visualisation

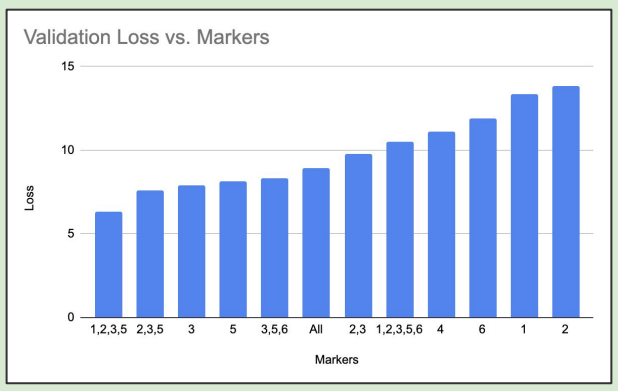
Feature and Layer Importance:

Through Leave-One-Out and manual evaluation using medical expertise, we find that in terms of marker importance:

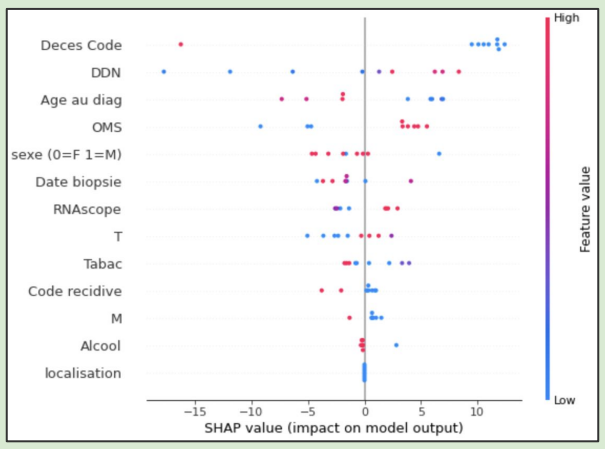
5 & 3 > 1 & 2 > 6 & 4

Feature importance from the tabular can be ranked as

1. Whether the person has died
2. How old they were
3. Age of diagnosis
4. Severity of condition
5. Gender:



Leave One Out: Average performance on validation sets across folds for markers



Feature importance from the tabular

Future Prospects

- Model optimization and explainability
- More clinical data
- Model deployment
- Clinical trials also in light of possibilities for vaccination now

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* Ciga, O., Xu, T. and Martel, A.L., 2022. Self supervised contrastive learning for digital histopathology. Machine Learning with Applications, 7, p.100198.
** Selvaraju, R.R., Cogswell, M., Das, A., Vedantam, R., Parikh, D. and Batra, D., 2017. Grad-cam: Visual explanations from deep networks via gradient-based localization. In Proceedings of the IEEE international conference on computer vision (pp. 618-626).