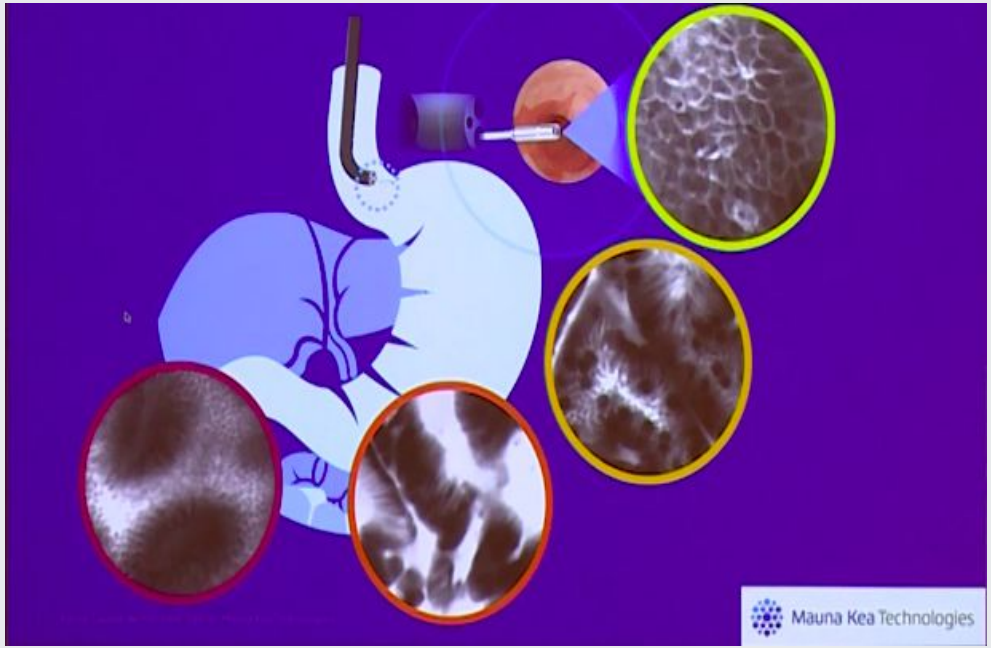
BOURBAKI

COLEGIO DE MATEMÁTICAS

Clasificación de imagenes de cáncer de esófago utilizando perceptrón

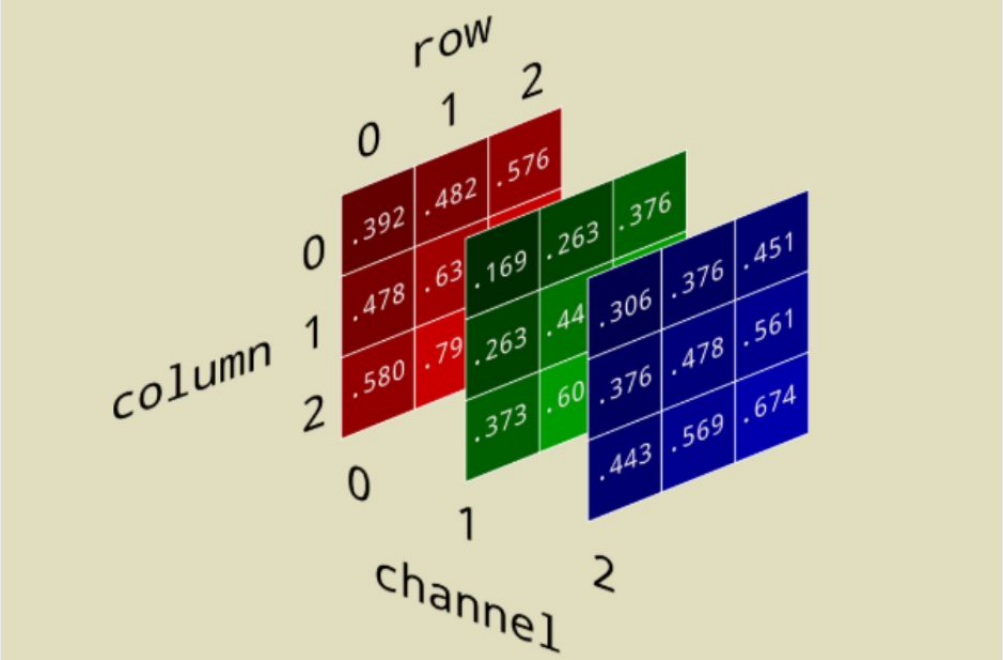
Detección y diagnóstico de cáncer de esófago en vivo a partir de imágenes microscópicas

9,446 Imágenes png, 8 bits, de 44 pacientes



- 1,469 Epitelio escamoso
- 3,177 Metaplasia Intestinal
- 3,594 Displasia / Cáncer
- 1,206 Metaplasia Gástrica

Cada imagen png-8 del reto, genera una matriz (519, 521, 3)



Fuente: «How to Convert a Picture to Numbers». Accedido 12 de mayo de 2020. https://e2eml.school/images_to_numbers.html

Cuando los valores de los tres canales del color RGB son idénticos, se obtiene un tono de gris entre 0 equivalente a negro y 255 equivalente a banco.

Matriz de confusión

		True condition			
	Total population	Condition positive	Condition negative	Prevalence = $\frac{\Sigma \text{ Condition positive}}{\Sigma \text{ Total population}}$	Accuracy (ACC) = $\frac{\Sigma \text{ True positive} + \Sigma \text{ True negative}}{\Sigma \text{ Total population}}$
Predicted condition	Predicted condition positive	**True positive**, Power	**False positive**, Type I error	Positive predictive value (PPV), Precision = $\frac{\Sigma \text{ True positive}}{\Sigma \text{ Predicted condition positive}}$	False discovery rate (FDR) = $\frac{\Sigma \text{ False positive}}{\Sigma \text{ Predicted condition positive}}$
	Predicted condition negative	**False negative**, Type II error	**True negative**	False omission rate (FOR) = $\frac{\Sigma \text{ False negative}}{\Sigma \text{ Predicted condition negative}}$	Negative predictive value (NPV) = $\frac{\Sigma \text{ True negative}}{\Sigma \text{ Predicted condition negative}}$
		True positive rate (TPR), Recall, Sensitivity, probability of detection = $\frac{\Sigma \text{ True positive}}{\Sigma \text{ Condition positive}}$	False positive rate (FPR), Fall-out, probability of false alarm = $\frac{\Sigma \text{ False positive}}{\Sigma \text{ Condition negative}}$	Positive likelihood ratio (LR+) = $\frac{\text{TPR}}{\text{FPR}}$	Diagnostic odds ratio (DOR) = $\frac{\text{LR+}}{\text{LR−}}$
		False negative rate (FNR), Miss rate = $\frac{\Sigma \text{ False negative}}{\Sigma \text{ Condition positive}}$	Specificity (SPC), Selectivity, True negative rate (TNR) = $\frac{\Sigma \text{ True negative}}{\Sigma \text{ Condition negative}}$	Negative likelihood ratio (LR−) = $\frac{\text{FNR}}{\text{TNR}}$	F_1 score = $\frac{2}{\frac{1}{\text{Recall}} + \frac{1}{\text{Precision}}}$

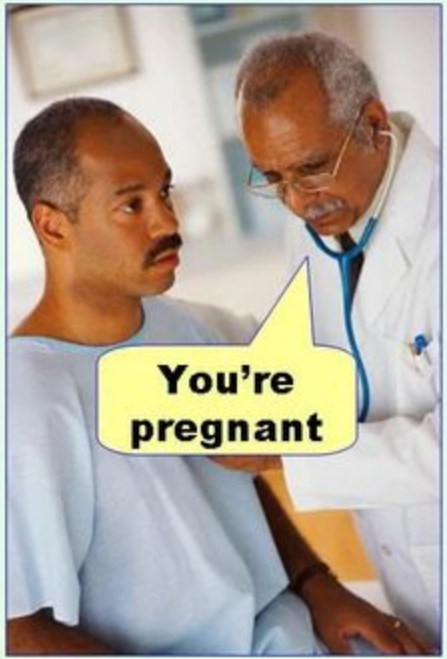
Fuente: K. Akepanidtaworn (Kyle), «Breaking Down Classification Evaluation Metrics», Medium, sep. 21, 2019. https://medium.com/@kyleake/classification-evaluation-scheme-the-breakdown-of-confusion-matrix-7b8066e978aa (accedido jun. 01, 2020).n

Métricas clasificación binaria

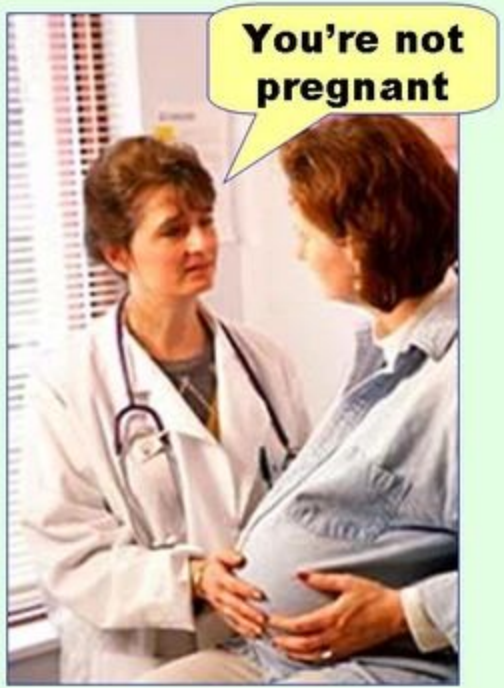
Metric	Formula	Interpretation
Accuracy	$\frac{TP + TN}{TP + TN + FP + FN}$	Overall performance of model
Precision	$\frac{TP}{TP + FP}$	How accurate the positive predictions are
Recall Sensitivity	$\frac{TP}{TP + FN}$	Coverage of actual positive sample
Specificity	$\frac{TN}{TN + FP}$	Coverage of actual negative sample
F1 score	$\frac{2TP}{2TP + FP + FN}$	Hybrid metric useful for unbalanced classes

Fuente

Type I error
(false positive)



Type II error
(false negative)



Referencias

- Countz, Thomas. «19-Line Line-by-Line Python Perceptron». Medium, 6 de abril de 2018. https://medium.com/@thomascountz/19-line-line-by-line-python-perceptron-b6f113b161f3
- Pratap, Ashish. alphrho/single_layer_perceptron. Jupyter Notebook, 2019. https://github.com/alphrho/single_layer_perceptron.
- «How to Train a Basic Perceptron Neural Network - Technical Articles». Accedido 21 de mayo de 2020. https://www.allaboutcircuits.com/technical-articles/how-to-train-a-basic-perceptron-neural-network/.