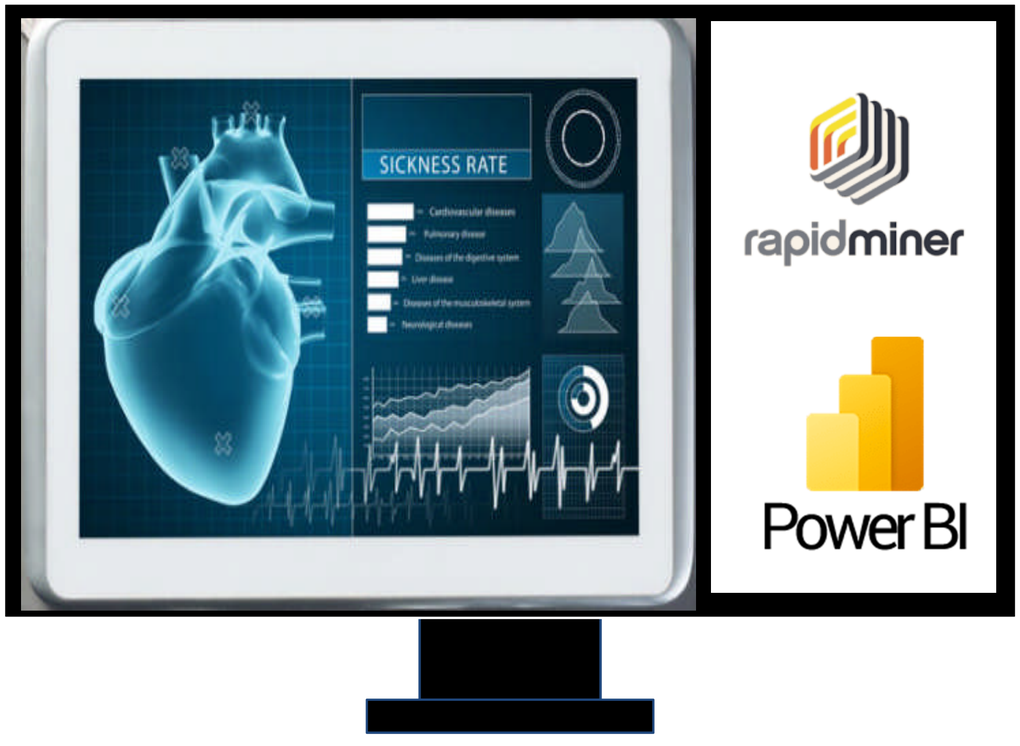
IDENTIFYING KEY FACTORS IN RIGHT VENTRICULAR INVOLVEMENT IN ISCHAEMIC AND NON-ISCHAEMIC CARDIOMYOPAT



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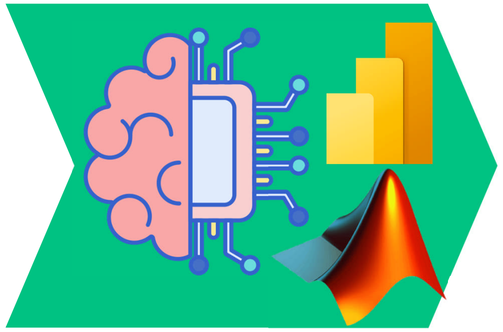
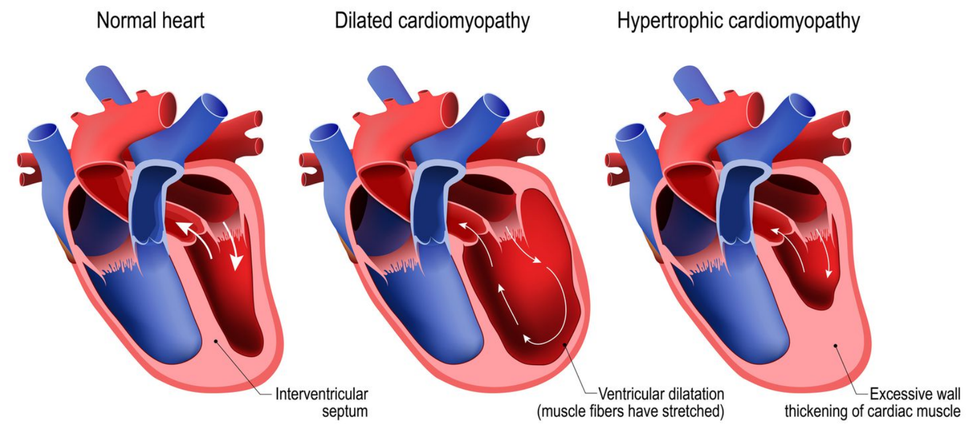


INTRODUCTION

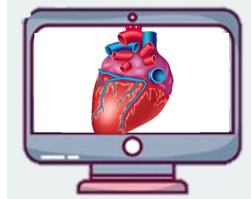
CONTEXT

- 8.9 million deaths worldwide in 2019
- Previous studies have focused on the left ventricle

Objetive: determine those clinical and cardiac parameters that influence right ventricular involvement in is- chaemic and non-ischaemic cardiomyopathy



THEORETICAL FRAMEWORK



Right ventricular

Machine Learning

Power BI

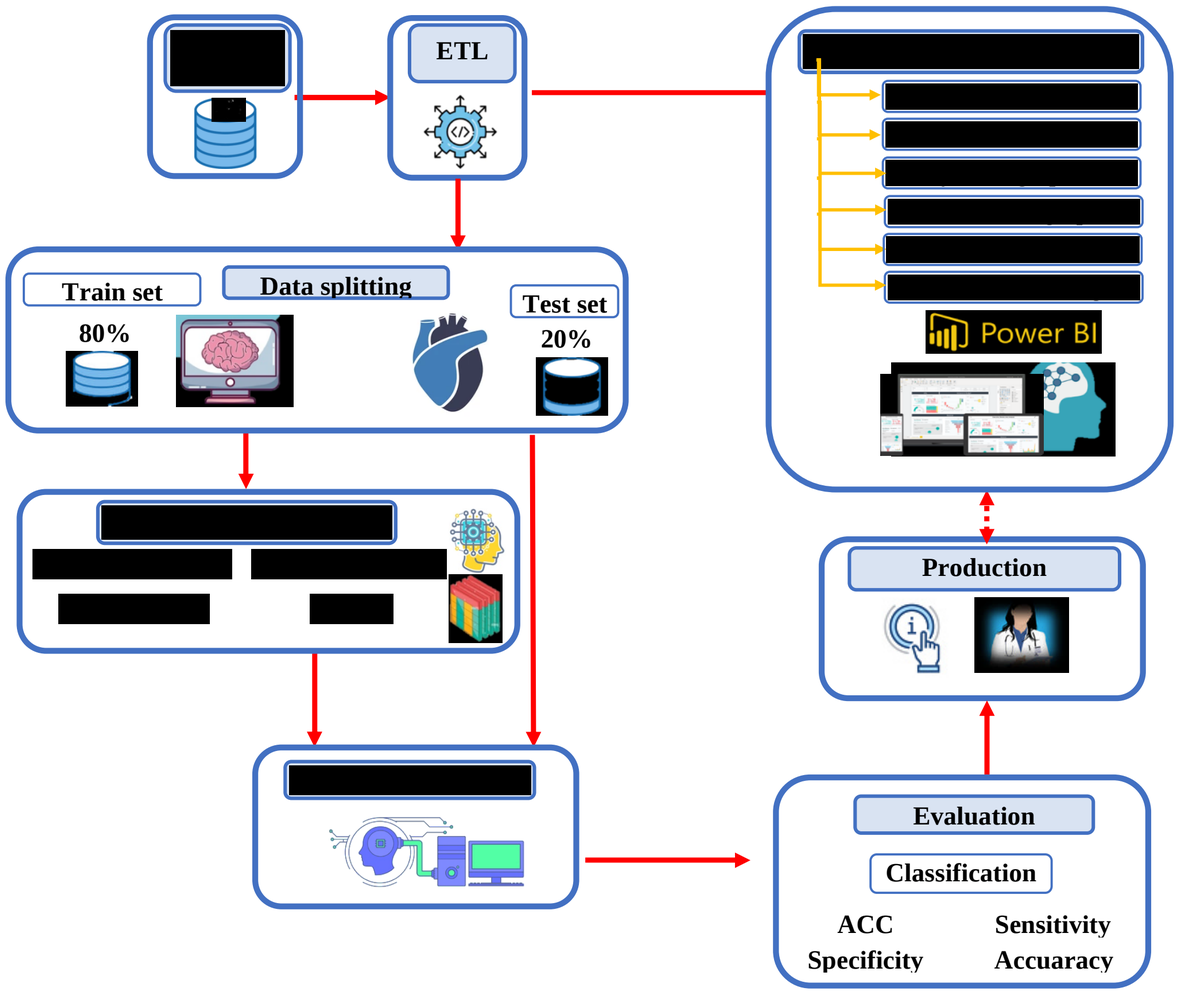
. M. Maceira, S. K. Prasad, M. Khan, and D. J. Pennell, “Reference right ventricular systolic and diastolic function normalized to age, gender and body surface area from steady-state free precession cardiovascular magnetic resonance,” European heart journal, vol. 27, no. 23, pp. 2879– 2888, 2006. [Crossref].

Vadillo-Valderrama, R. Goya-Esteban, R. Caulier-Cisterna, A. García-Alberola, and J.L. Rojo-Álvarez. Differential beat accuracy for ecg family classification using machine learning. *IEEE Access*, 10:129362–129381, 2022 [CrossRef].

Wilfred Bonney. Applicability of business intelligence in electronic health record. *Procedia-Social and Behavioral Sciences*, 73:257–262, 2013 [CrossRef].

METODOLOGY

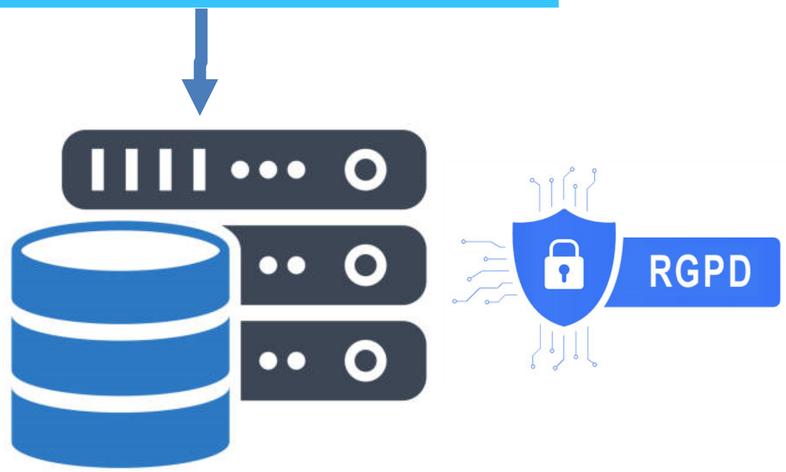
- Literature review
- Agile
- Overleaf
- ML y Power BI



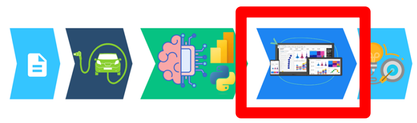
Database

RENISEN

- 1,815 variables
- 56,447 patients



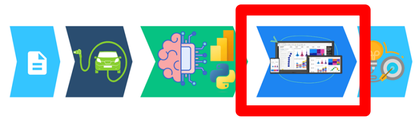
Main variables				
Variable	***Categories***	***n***	***%***	***Miss.***
Gender	Males	9260	76,6	0
	Females	2823	23,4	0
Dyslipidemia	Yes	6231	51,6	0
	No	5852	48,4	0
Hypertension	Yes	7133	59,0	0
	No	4950	41,0	0
Diabetes	Yes	85	0,7	0
	No	11998	99,3	0
Diabetes II	Yes	8131	67,3	0
	No	3952	32,7	0
Smoker	Yes	8800	72,8	0
	No	3283	27,2	0
Stent	Yes	9937	82,2	0
	No	2146	17,8	0
Stress study	Yes	5857	48,5	0
	No	6226	51,5	0
	$\bar{X}$	***SD***	***Min***	***Max***
PVR [wood]	14,99	1,27	0,49	18,97
Aortic.Arch	25,71	3,68	2	60
Height (cm)	167,86	9,13	131	205
Weight (kg)	78,63	14,96	35	187
Vol.reg.Ao. dif.vol.lat	4,31	24,27	-247	305
DoA.PA	0,96	0,25	0,01	5,01
Desc.T.Ao	24,43	3,85	2	63
Sinus.P	34,1	4,77	9	83
PWD	8,63	2,75	1	125
diastolic RV	1,59	0,71	0,17	10,88



Data preparation

- Elimination of variables with higher correlations
- Removal of inconsistent data
- Heights < 1 metre and > 2.3 metre or ages < 0 and > 120 years.
- For having all data set to 0
- ……

These are reduced to 12,083 patients and 120 variables.



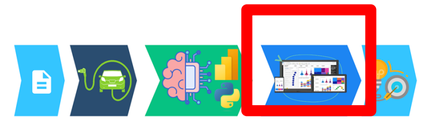
Data labels

- Right ventricle labels. standard ranges by rv volumes, systolic function and mass by age interval (95% confidence interval). adapted from Maceira et al. (2006).

Right Ventricule labels						
Age (years)	***20-29***	***30-39***	***40-49***	***50-59***	***60-69***	***70-79***
Males						
Absolute values						
1-1 EDV (mL) SD 25.4	(127,227)	(121,221)	(116,216)	(111,210)	(105,205)	(100,200)
ESV (mL) SD 15.2	(38,98)	(34,94)	(29,89)	(25,85)	(20,80)	(16,76)
SV (mL) SD 17.4	(74,143)	(74,142)	(73,141)	(72,140)	(71,139)	(70,138)
EF (%) SD 6.5	(48,74)	(50,76)	(52,77)	(53,79)	(55,81)	(57,83)
Mass (g) SD 14.4	(42,99)	(40,97)	(39,95)	(37,94)	(35,92)	(33,90)
Normalized to BSA						
EDV/BSA (mL//m^(2)) SD 11.7	(68,114)	(65,111)	(62,108)	(59,105)	(56,101)	(52,98)
ESV/BSA (mL//m^(2)) SD 7.4	(21,50)	(18,47)	(16,45)	(13,42)	(11,40)	(8,37)
Females						
Absolute values						
1-1 EDV (mL) SD 21.6	(100,184)	(94,178)	(87,172)	(81,166)	(75,160)	(69,153)
ESV (mL) SD 13.3	(29,82)	(25,77)	(20,72)	(15,68)	(11,63)	(6,58)
SV (mL) SD 13.1	(61,112)	(59,111)	(58,109)	(56,108)	(55,106)	(53,105)
EF (%) SD 6	(49,73)	(51,75)	(53,77)	(55,79)	(57,81)	(59,83)
Mass (g) SD 10.6	(33,74)	(31,72)	(28,70)	(26,68)	(24,66)	(22,63)
Normalized to BSA						
1-1 EDV/BSA (mL//m^(2)) SD 9.4	(65,102)	(61,98)	(57,94)	(53,90)	(49,86)	(45,82)
ESV/BSA (mL//m^(2)) SD 6.6	(20,45)	(17,43)	(14,40)	(11,37)	(8,34)	(6,32)

RV involvement (normal) in a percentage of 59.1% (n = 7139) and with RV involvement (abnormal) in a percentage of 40.9% (n = 4944).

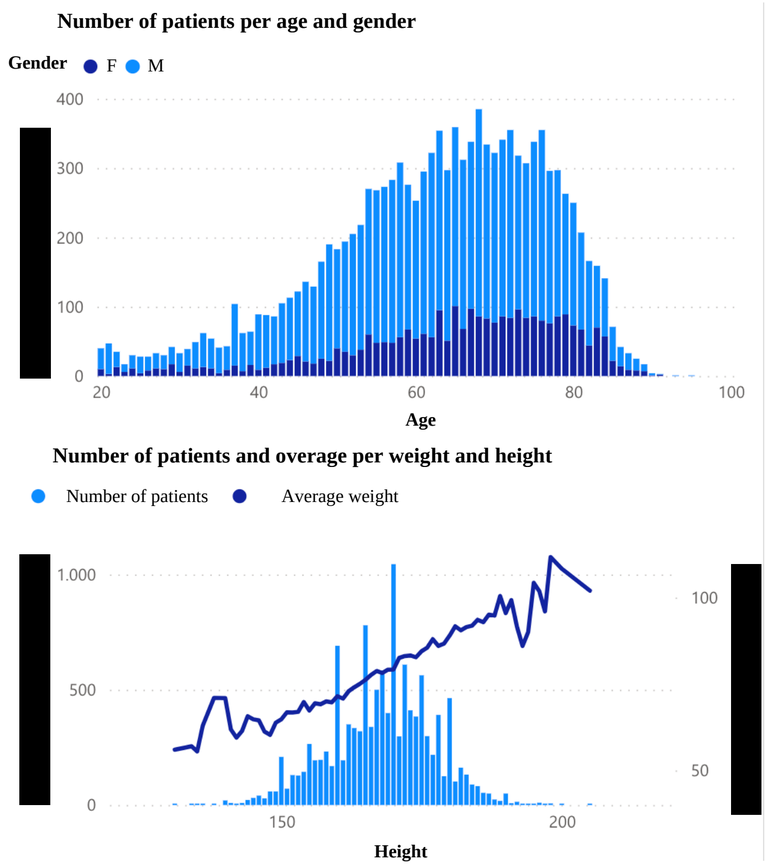
RESULTS

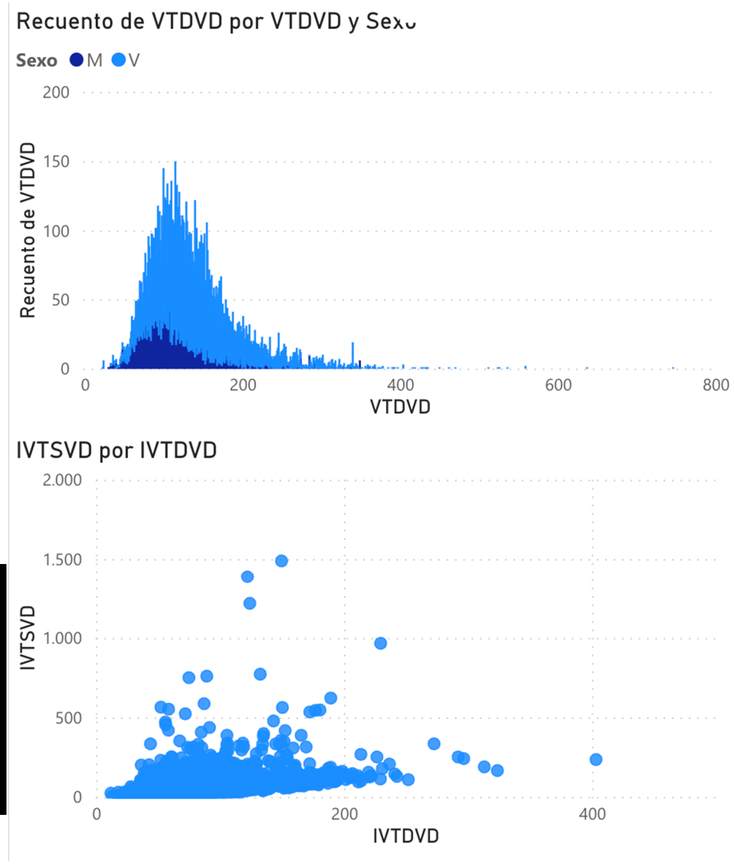


Power BI

Distributions

Outlayer





RESULTS

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Algorithms	ACC	SE	SP	NPV	AUC
SVM	0.76	0.76	0.76	0.77	0.79
Random Forest	0.78	0.78	0.79	0.78	0.82
Neural Network	0.78	0.78	0.79	0.77	0.85
XGBoost	0.82	0.78	0.80	0.77	0.87

Database

Elimina los NaN

Clinical criterio

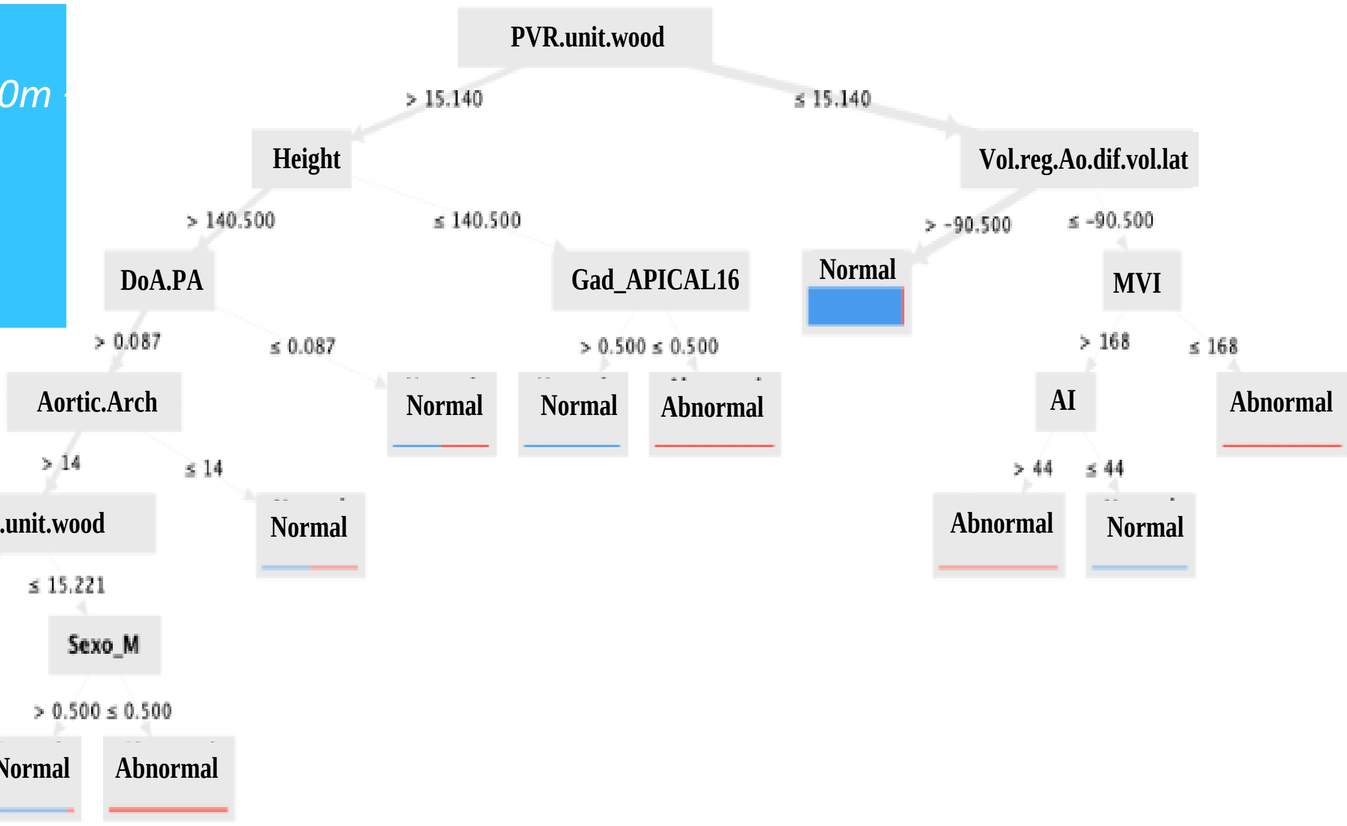
Undersampling

Technical criteria

XGBoost

RESULTS

- *RV involvement (Abnormal): If PVR.en.units.wood > 15.221 + Height > 1.40m + DoA.PA > 0.087 + Aor- tic.arch > 14.*
- *No RV involvement (normal): If PVR.en.units.wood ¡ 15.221 and Ao.reg.Vol.beat.vol.dif >-90.500.*



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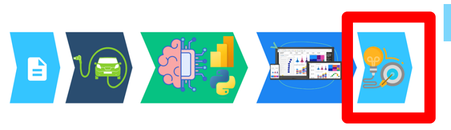

CONCLUSION

- Interdisciplinary

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Power BI

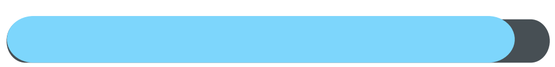
- Influence of pulmonary vascular resistance and aortic artery beat volume difference as key factors, Other variables with height (BMI), DoA.PA and Ao.reg.Vol.beat.vol.dif.

- Reaching an AUC of 87,7% with XGBoost in decision trees.

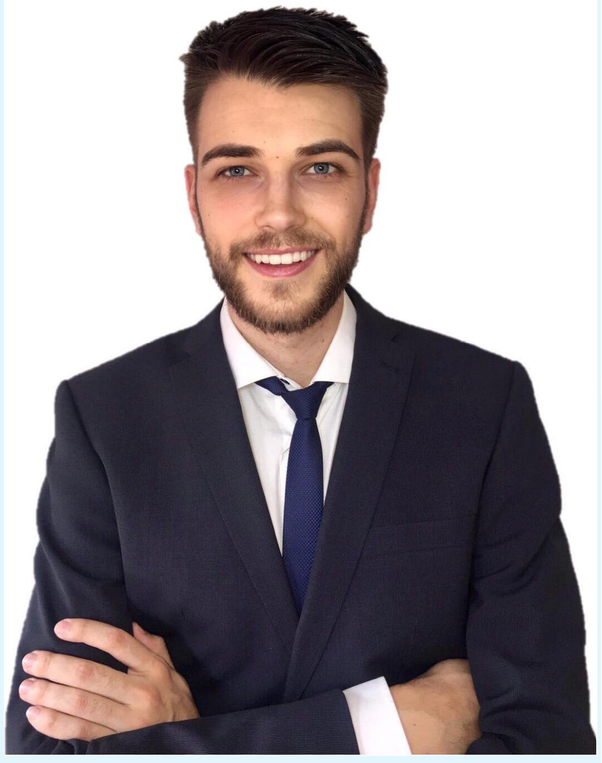
- Clinical visualisation of results

- Distributions and outlayer

- High survival predictor



9/10 patients



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¡Thanks you!

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