

The ARDS Prediction Via Machine Learning

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Introduction

- + Inflamed lungs = can't breath
- + Drowning, can't breath
- + Pre-symptoms; pre-alignments
- + 20 - 50 % mortality



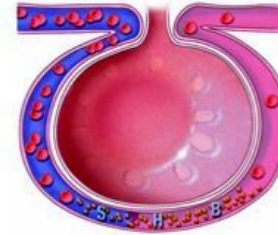
Now I get it!

Alveolar changes in ARDS

The alveoli undergo major changes in each phase of ARDS.

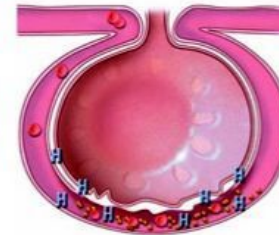
Phase 1

In *phase 1*, injury reduces normal blood flow to the lungs. Platelets aggregate and release histamine (H), serotonin (S), and bradykinin (B).



Phase 2

In *phase 2*, those substances—especially histamine—inflame and damage the alveolocapillary membrane, increasing capillary permeability. Fluids then shift into the interstitial space.



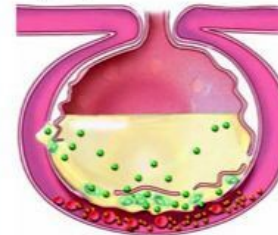
Phase 3

In *phase 3*, as capillary permeability increases, proteins and fluids leak out, increasing interstitial osmotic pressure and causing pulmonary edema.



Phase 4

In *phase 4*, decreased blood flow and fluids in the alveoli damage surfactant and impair the cell's ability to produce more. As a result, alveoli collapse, impeding gas exchange and decreasing lung compliance.



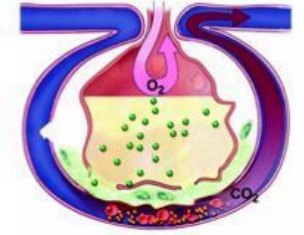
Phase 5

In *phase 5*, sufficient oxygen can't cross the alveolocapillary membrane, but carbon dioxide (CO₂) can and is lost with every exhalation. Oxygen (O₂) and CO₂ levels decrease in the blood.



Phase 6

In *phase 6*, pulmonary edema worsens, inflammation leads to fibrosis, and gas exchange is further impeded.



Methods

Data Process

- + The data was given in encoded using cTAKES
- + The data was tokenized, and kept in dictionary using countvectorizer
- + Used tfidfTransformer, to standardize the data
- + K-fold
- + Grid Search

Algorithm

- + Multinomial Naive bayes
- + LinearSVC
- + SVC
- + SGD Classification
- + Decision Tree Classifier

Results

{'clf__C': 10.0, 'clf__gamma': 0.1, 'clf__kernel': 'rbf'}

Accuracy: 0.774

	precision	recall	f1-score	support
0	0.82	0.89	0.85	79
1	0.57	0.44	0.50	27
avg / total	0.76	0.77	0.76	106

SVC

[[70 9]

[15 12]]

{'clf__criterion': 'entropy', 'clf__max_depth': 5, 'clf__max_leaf_nodes': 10, 'clf__min_samples_leaf': 10, 'clf__min_samples_split': 2}

Accuracy: 0.868

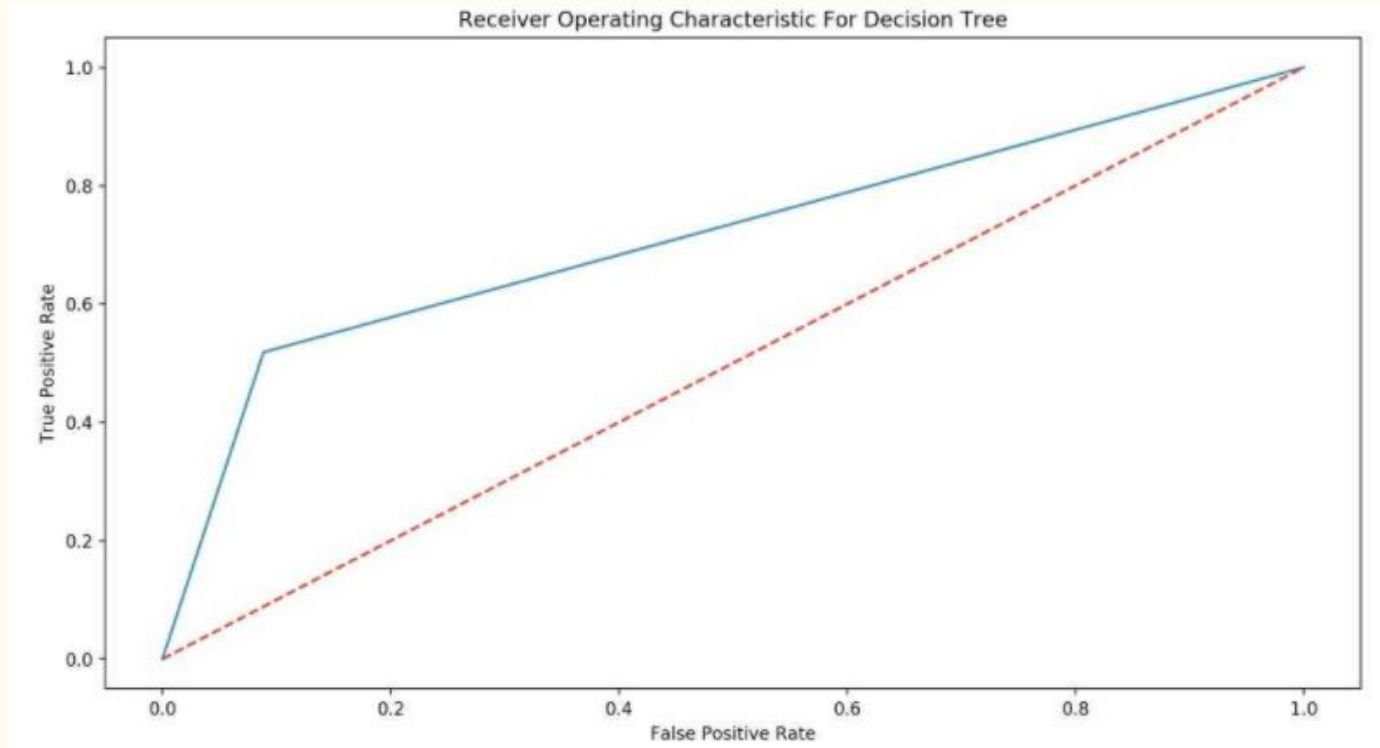
	precision	recall	f1-score	support
0	0.87	0.97	0.92	79
1	0.88	0.56	0.68	27
avg / total	0.87	0.87	0.86	106

Tree

[[77 2]

[12 15]]

ROC Curve for Decision Tree



Confusion Matrix

		SGDClassifier Prediction	
		p	n
Actual Value	p'	TP 18	FN 9
	n'	FP 13	TN 66

		Decision Tree Prediction	
		p	n
Actual Value	p'	TP 15	FN 12
	n'	FP 2	TN 77

Conclusion

- + Decision Tree did a better job on average F1 Score
- + F1 score for positive class is better using SGD classifier