Real-Time Driver Drowsiness Recognition System

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Supervised by:
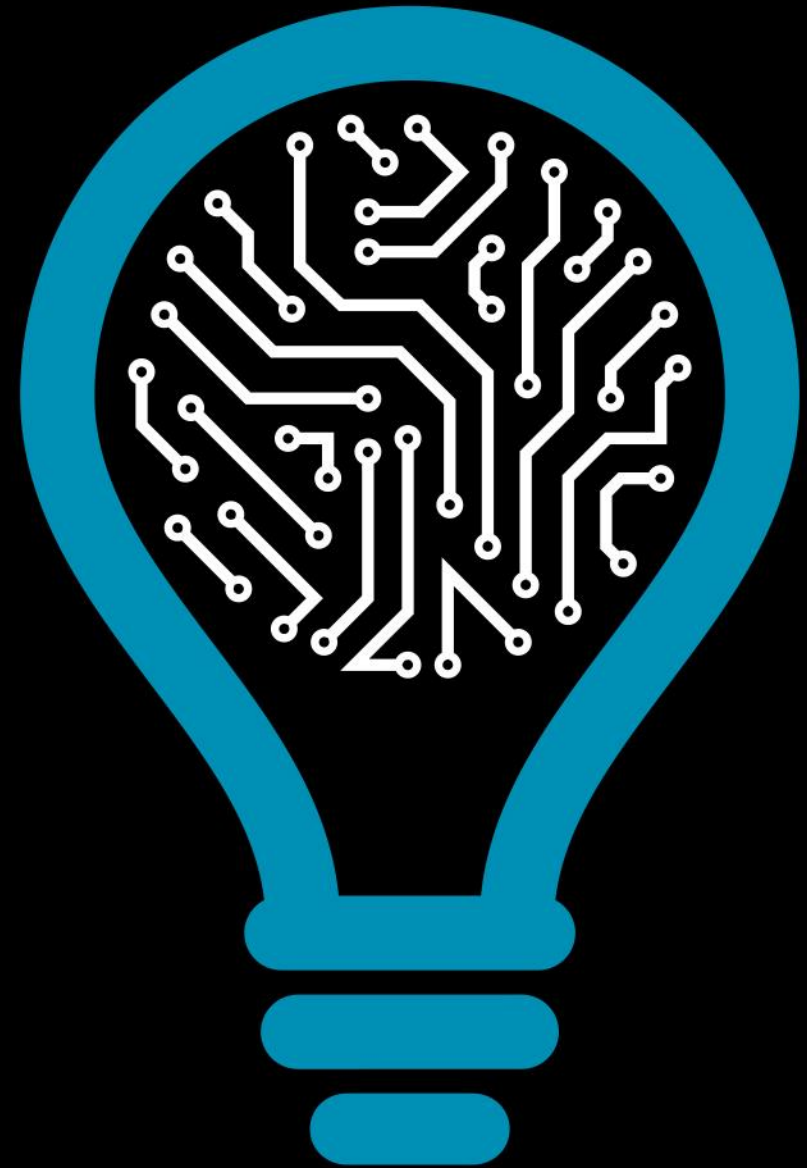
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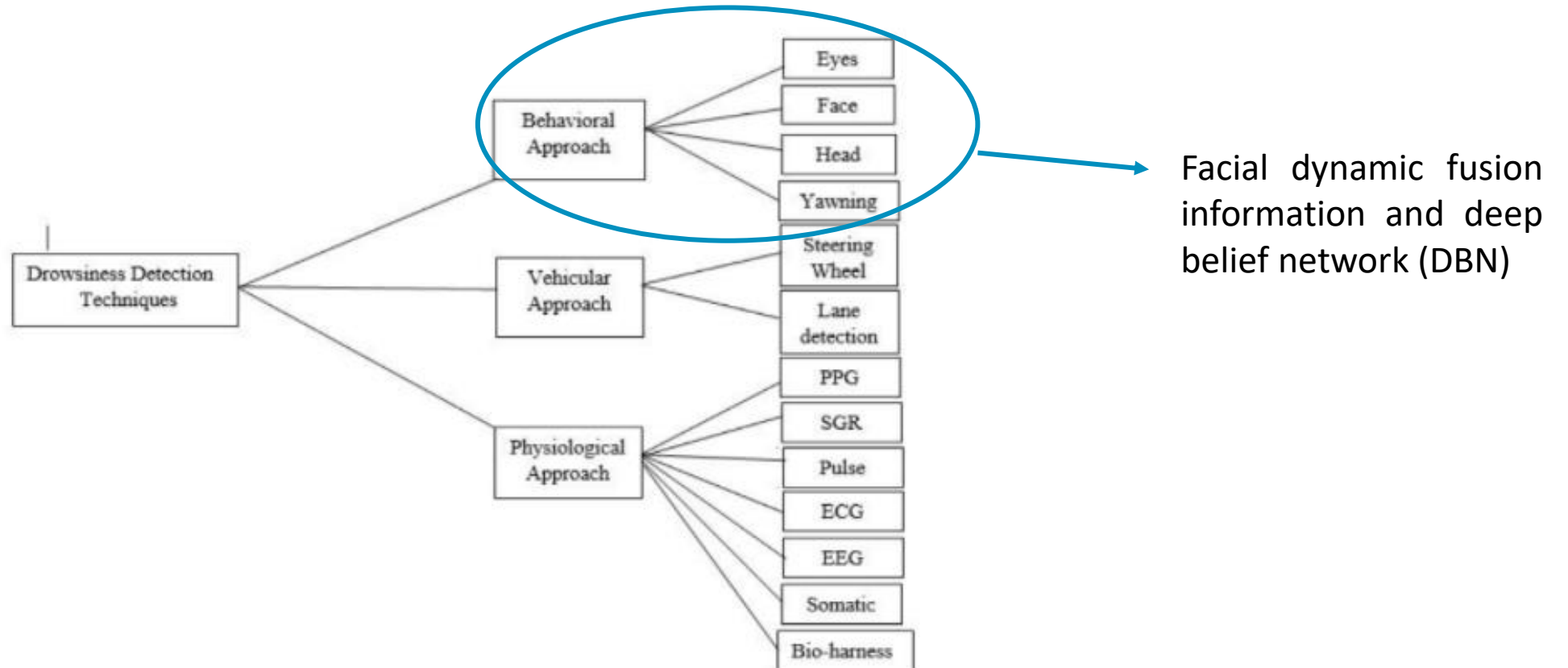DE SISTEMAS E COMPUTADORES,
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Motivation

- Drowsiness is a major cause of road accidents.

- Automatic drowsiness monitoring systems promise to drastically reduce the number of road accidents
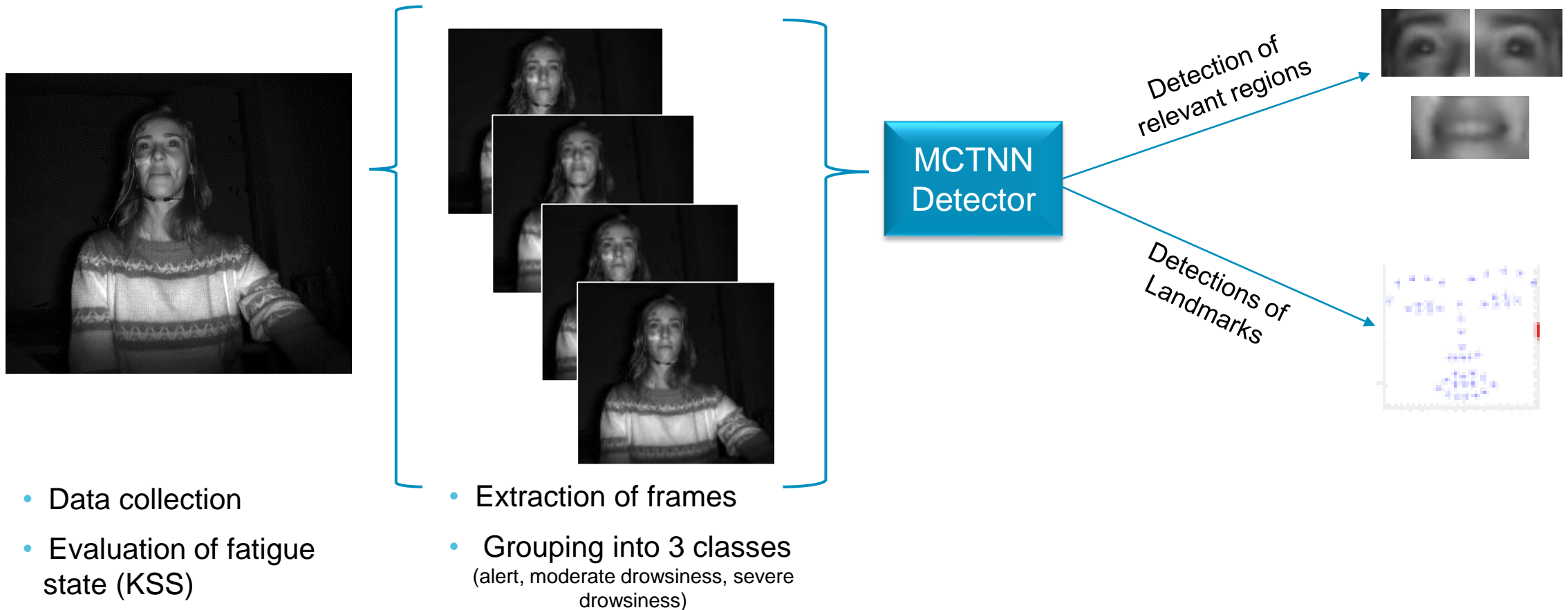
Objectives

- Development automatic face image/video-based drowsiness recognition

Facial dynamic fusion information and deep belief network (DBN)

Work Description

- Data processing, labeling and feature extraction…

Detection of relevant regions

Detections of Landmarks

MCTNN Detector

- Data collection

- Evaluation of fatigue state (KSS)

- Extraction of frames

- Grouping into 3 classes
(alert, moderate drowsiness, severe drowsiness)

4
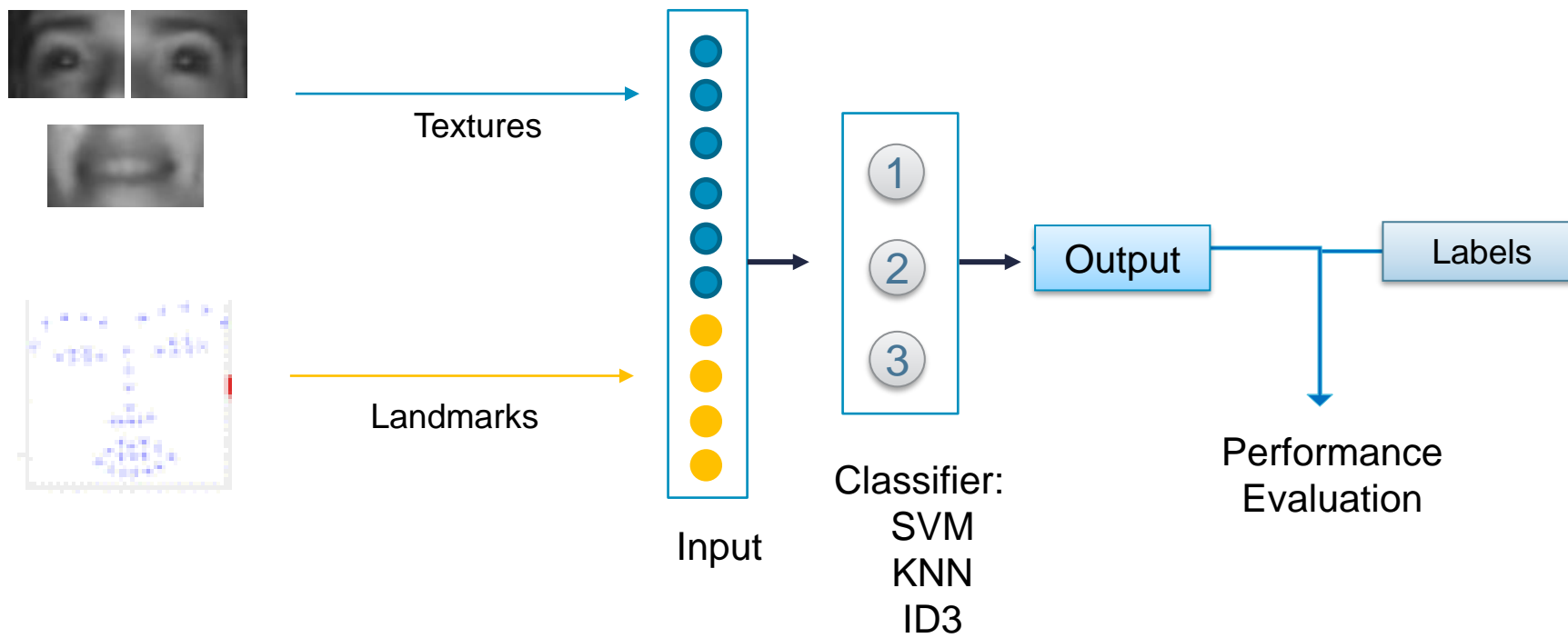
Work Description

- Dynamic fusion information and DBN
- Classification and Performance Evaluation (Train 70%, Test 30%)

Textures

Landmarks

Input

DBN
(deep belief network)

Classifier

Output

Labels

Performance Evaluation
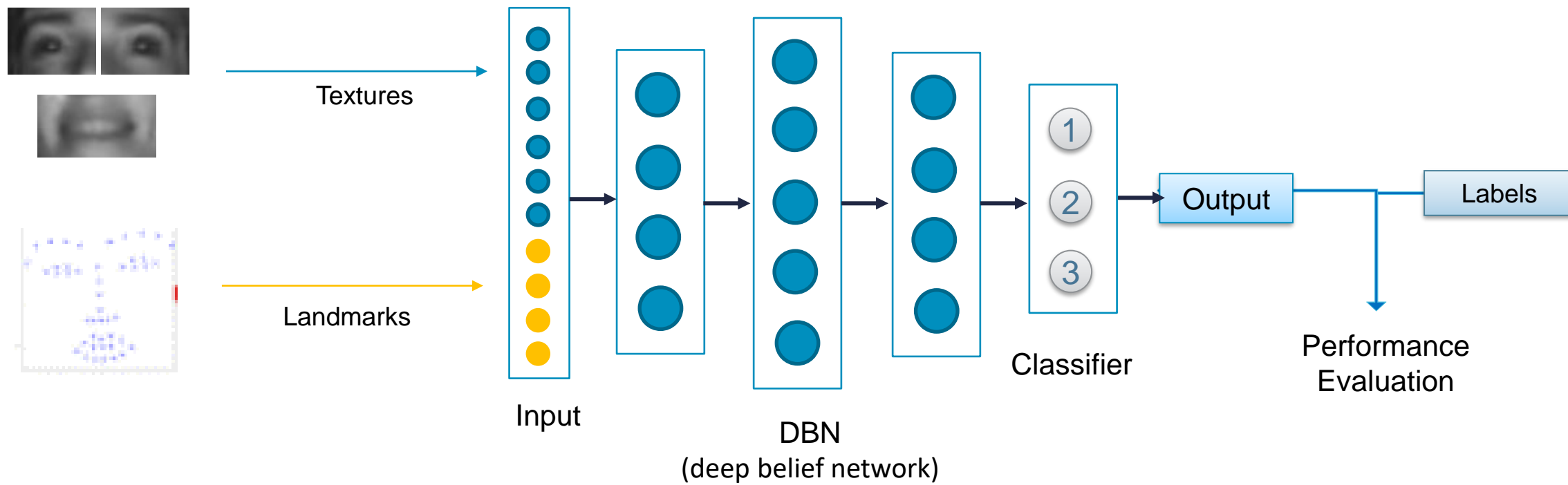
Work Description

- Model Performance Comparison

Textures

Landmarks

Input

Classifier:
SVM
KNN
ID3

1
2
3

Output

Labels

Performance
Evaluation

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Obtained Results

- Comparison of the algorithms using single information and fusion information

Table I - Comparison of decision tree algorithm using single information and fusion information

	Alert %	MD %	SD %	Accuracy %
Landmarks	89,1	95,5	96,4	93,8
Textures	90,2	93,4	93,5	92,4
Fusion Information	96,3	96,1	97	96,5

Obtained Results

- Comparison results of the methods that use DBN and other classifiers based on fusion information

Table II - Results described in the literature

	Alert ,%	MD,%	SD ,%	Accuracy %
SVM	98,3	93,2	82,6	93,7
KNN	93,6	90,9	86,8	91,5
DecisionTree	87,1	98,9	97,4	80,5
DBN	95,6	98,9	97,4	96,7

Table III - Results obtained

	Alert ,%	MD,%	SD ,%	Accuracy %
SVM	98,6	98,5	98,8	98,7
KNN	97,5	97,9	98,6	98,1
DecisionTree	96,3	96,1	97	96,5
DBN	0	0	100	47,6

Obtained Results

- Comparison results of the methods that use DBN and other classifiers based on fusion information

Table IV - Comparison between the results obtained and those described in the literature

	Alert ,%	MD,%	SD ,%	Accuracy %	
SVM	98,3	93,2	82,6	93,7	+ 5,0%
	98,6	98,5	98,8	98,7	
KNN	93,6	90,9	86,8	91,5	+ 6,6%
	97,5	97,9	98,6	98,1	
DecisionTree	87,1	98,9	97,4	80,5	+ 16,0%
	96,3	96,1	97,0	96,5	
DBN	95,6	98,9	97,4	96,7	-49,1%
	0	0	100	47,6	

Conclusions

- Algorithms that use dynamic fusion information outperform models that use single information.

- The DBN model approach should be further explored.

Future work

- Increase number of samples in the dataset.

- Use alternative techniques to obtain the textures/features of the images.

Thanks for listening !

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