Athletic Runner Injury Prediction System

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Contents

Overview

- By leveraging advanced machine learning techniques, we empower athletes to proactively manage their well-being, optimize performance, and contribute to the broader goals of health, innovation, and sustainability in sports and society.

Problem Statement

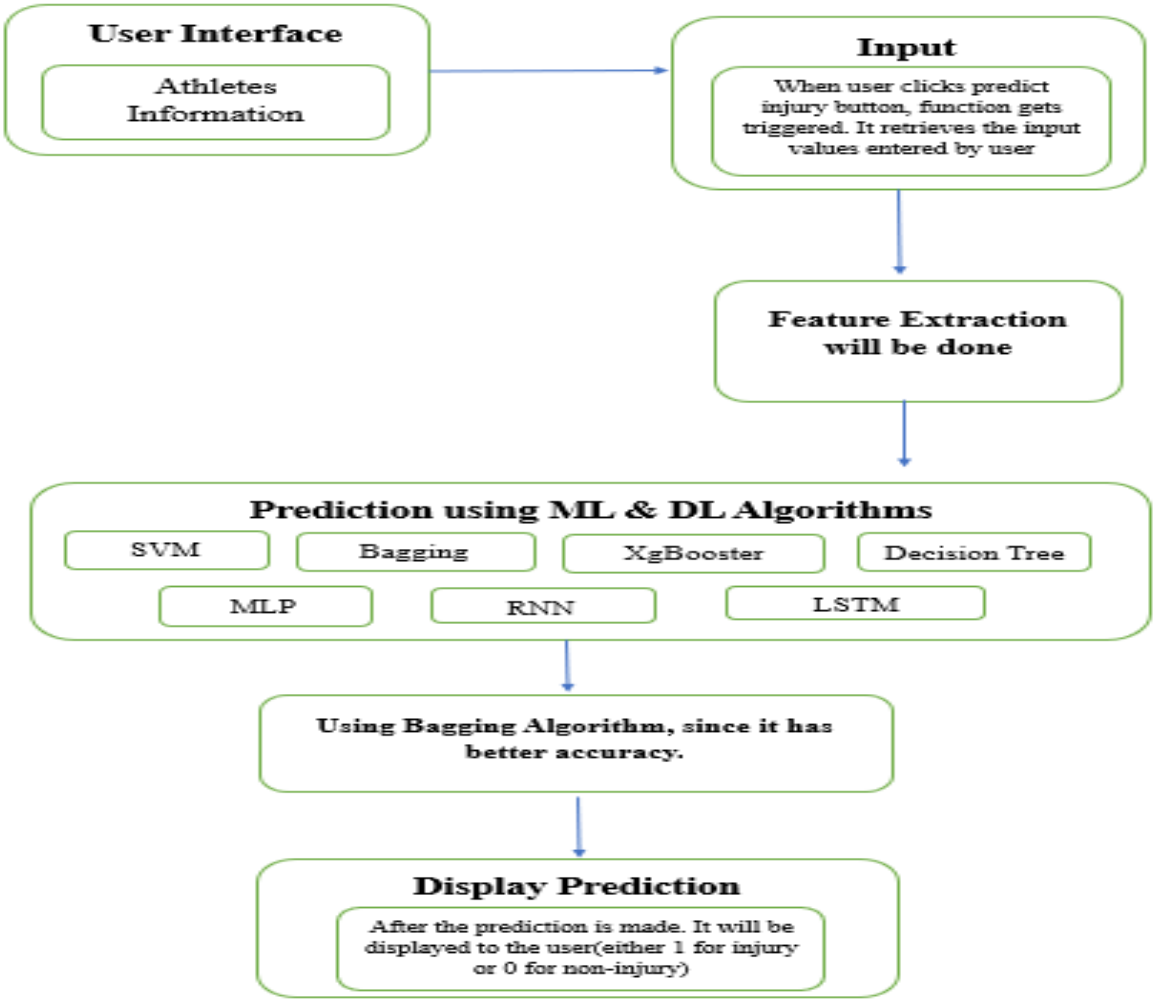
- Running is one of the most popular sports in the world.
- 60 million people participated in jogging, running, or trail running in America alone in 2017. But it is reported that 50 percent of runners get injured every year.

Objectives

Model Development

- Performing feature extraction and identifying the feature importance for Injury Prediction For Athletic Runners.
- Building model for injury prediction for athletic runners using machine learning techniques.

Graphical Representation



Dataset

- The data set consists of a detailed training log from a Dutch high-level running team over a period of seven years (2012-2019).

	nr. sessions	nr. rest days	total kms	max km one day	total km Z3-Z4-Z5-T1-T2	nr. tough sessions (effort in Z5, T1 or T2)	nr. days with interval session	total km Z3-Z4	max km Z3-4 one day	total km Z5-T1-T2	...	max training success.2	avg recovery.2	min recovery.2	max recovery.2	Athlete ID	injury	rel total kms week 0_1	rel total kms week 0_2	rel total kms week 1_2	Date
0	5.0	2.0	22.2	16.4	11.8	1.0	2.0	10.0	10.0	0.6	...	0.0	0.18	0.16	0.20	0	0	0.718447	1.378882	1.919255	0
1	5.0	2.0	21.6	16.4	11.7	1.0	2.0	10.0	10.0	0.5	...	0.0	0.18	0.16	0.20	0	0	0.683544	1.018868	1.490566	1
2	5.0	2.0	21.6	16.4	11.7	1.0	2.0	10.0	10.0	0.5	...	0.0	0.17	0.16	0.18	0	0	0.683544	1.018868	1.490566	2
3	5.0	2.0	21.6	16.4	11.7	1.0	2.0	10.0	10.0	0.5	...	0.0	0.18	0.16	0.18	0	0	0.683544	1.018868	1.490566	3

Methodology

- Data Preprocessing:
  - Reading the data
  - Splitting data
  - Dimensionality reduction
- Exploratory data analysis:
  - This involves visualizing the distribution of injury and non-injury.
  - Exploring correlations between features and the target variable(Injury).

- Model building:
  - SVM
  - Bagging
  - XgBooster
  - Decision tree
  - MLP
  - RNN
  - LSTM
- Evaluation:
  - Confusion matrices to visualize the performance of each model, particularly in terms of true positives, true negatives, false positives, and false negatives.
  - Accuracy for each model.

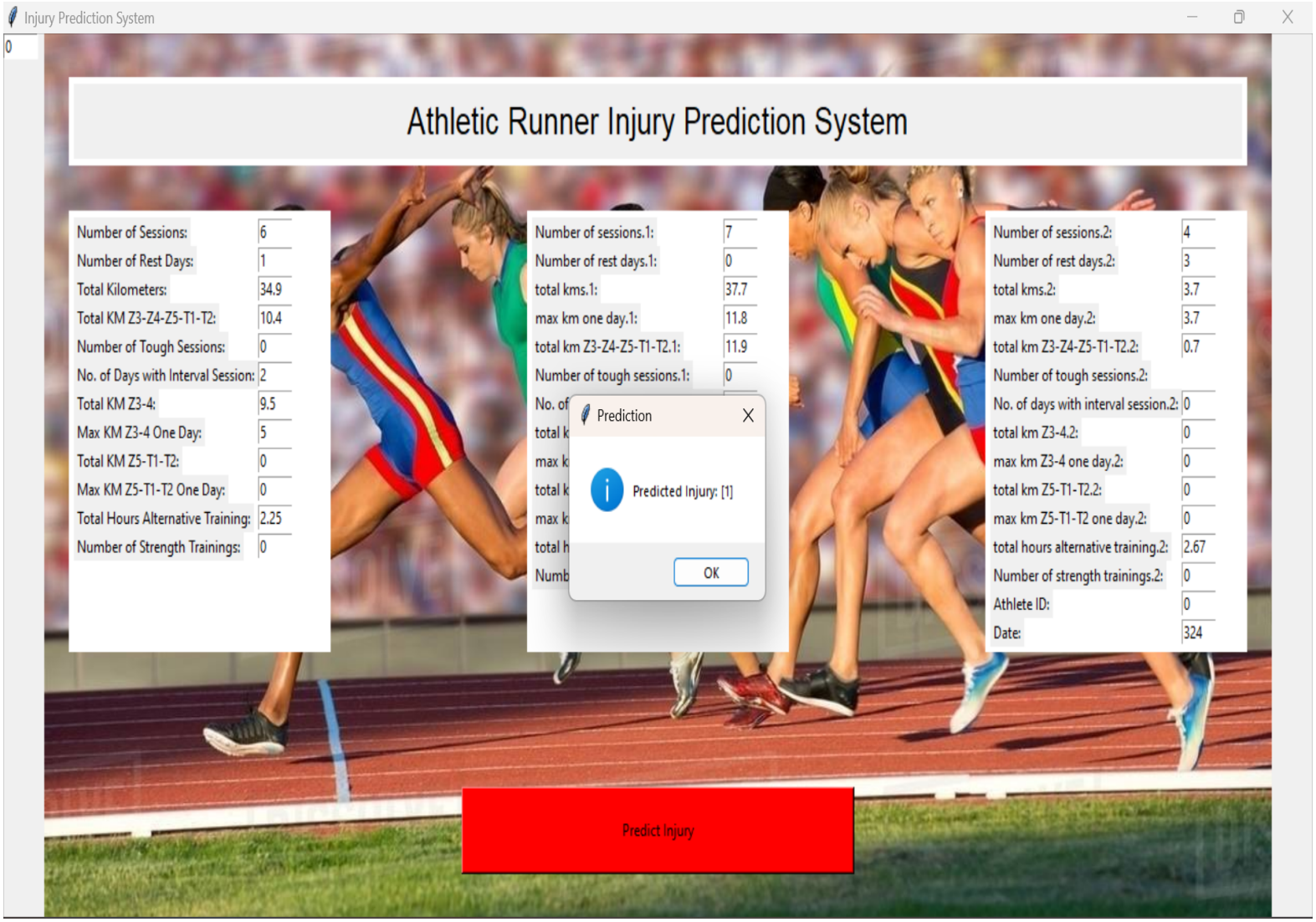
Results and Discussion

DATASET	SVM			Bagging			XgBooster		
	Accuracy	Precision	F1 Score	Accuracy	Precision	F1 Score	Accuracy	Precision	F1 Score
575*42224	**0.94**	0.03	0.05	**0.98**	0	0	**0.98**	1	0.01
575*575	0.58	0.57	0.6	0.57	0.57	0.6	0.68	0.65	0.71
1150*1150	0.65	0.63	0.67	0.78	0.74	0.8	0.71	0.67	0.74
1725*1725	0.7	0.68	0.71	**0.88**	**0.83**	**0.89**	0.72	0.68	0.75
2300*2300	0.7	0.66	0.73	**0.92**	**0.88**	**0.92**	0.73	0.69	0.75
2875*2875	0.73	0.69	0.75	**0.94**	**0.91**	**0.95**	0.71	0.68	0.74

Results and Discussion

DATASET	Decision Tree			MLP			RNN			LSTM		
	Accuracy	Precision	F1 Score	Accuracy	Precision	F1 Score	Accuracy	Precision	F1 Score	Accuracy	Precision	F1 Score
575*42224	**0.97**	0.03	0.04	**0.87**	0.02	0.04	**0.94**	0.01	0.03	**0.95**	0.03	0.05
575*575	0.58	0.53	0.58	0.58	0.57	0.45	0.58	0.55	0.55	0.5	0.4	0.6
1150*1150	0.79	0.76	**0.81**	0.51	0.59	0.3	0.65	0.6	0.73	0.64	0.62	0.7
1725*1725	**0.85**	**0.8**	**0.86**	0.63	0.62	0.66	0.6	0.56	0.72	0.62	0.59	0.71
2300*2300	**0.89**	**0.83**	**0.9**	0.54	0.73	0.28	0.57	0.66	0.42	0.61	0.6	0.65
2875*2875	**0.92**	**0.86**	**0.92**	0.68	0.62	0.74	0.6	0.62	0.57	0.61	0.58	0.69

Results and Discussion



Report Structure

- Introduction
- Related Work
- Dataset
- Proposed Method
- Results and Discussion
- Conclusion

Key Findings

- Data set is biased for non-injured cases.
- Machine Learning models performed better than deep learning models.

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Thank you