Athletic Runner Injury Prediction System

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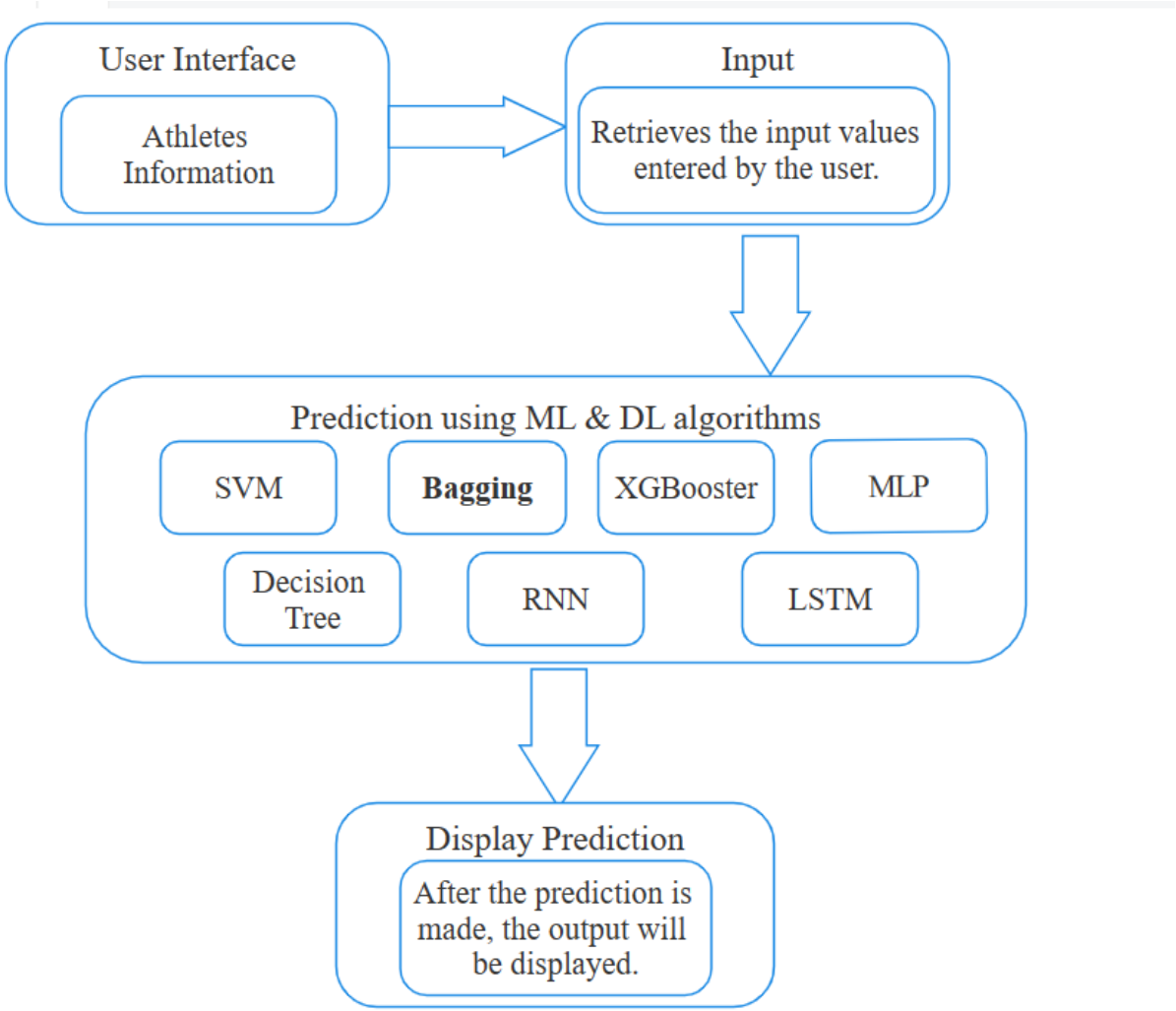
Contents

Summary of stage-I

- Understood all the attributes of dataset and explored correlations between features and the target variable(Injury).
- Performed data preprocessing to check for the null values.
- Developed a model which accurately predicts the athlete is injured or not.
- Used various evaluation metrics such as confusion matrices and accuray score for each model.

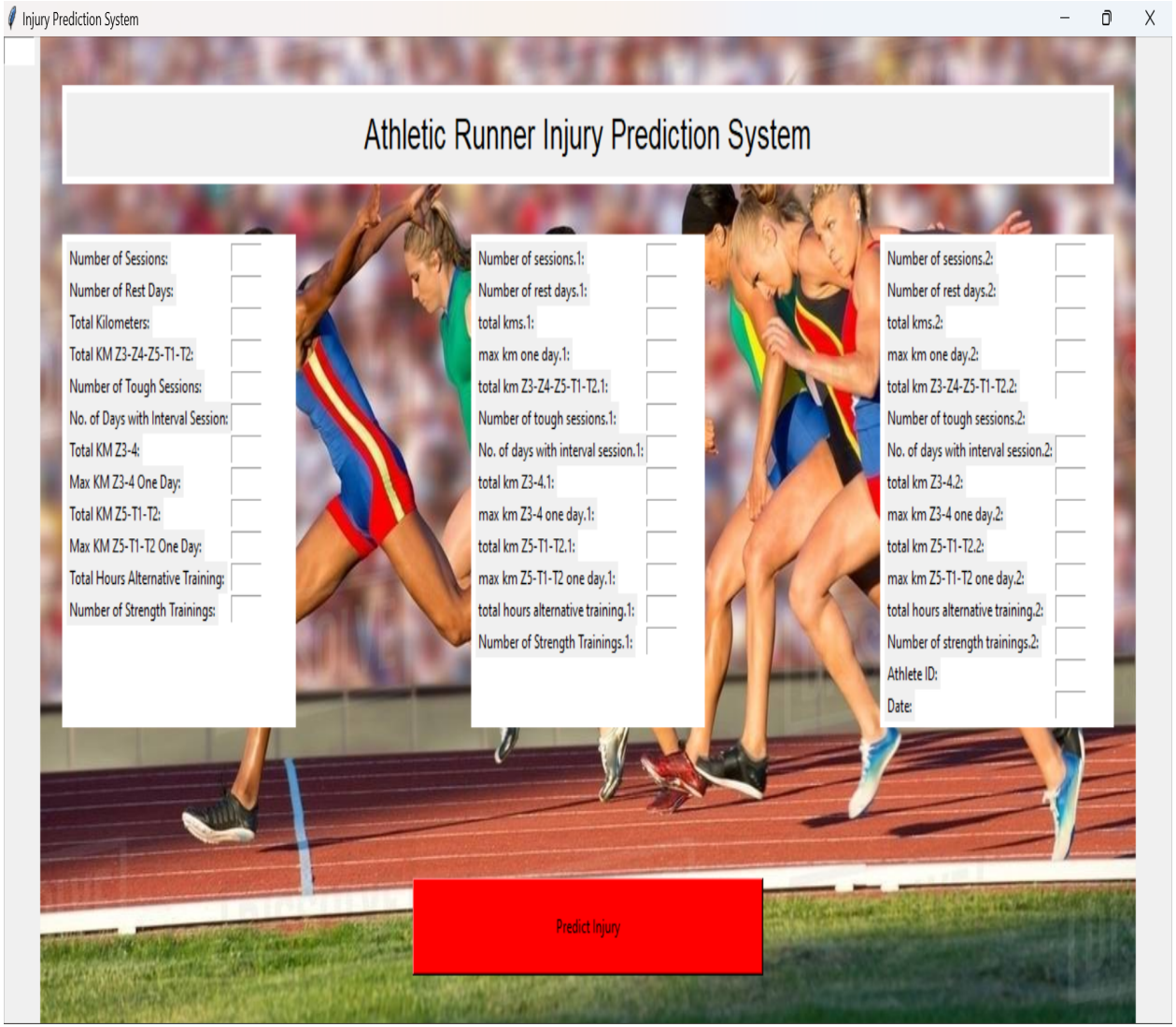
Implementation

Project Architecture



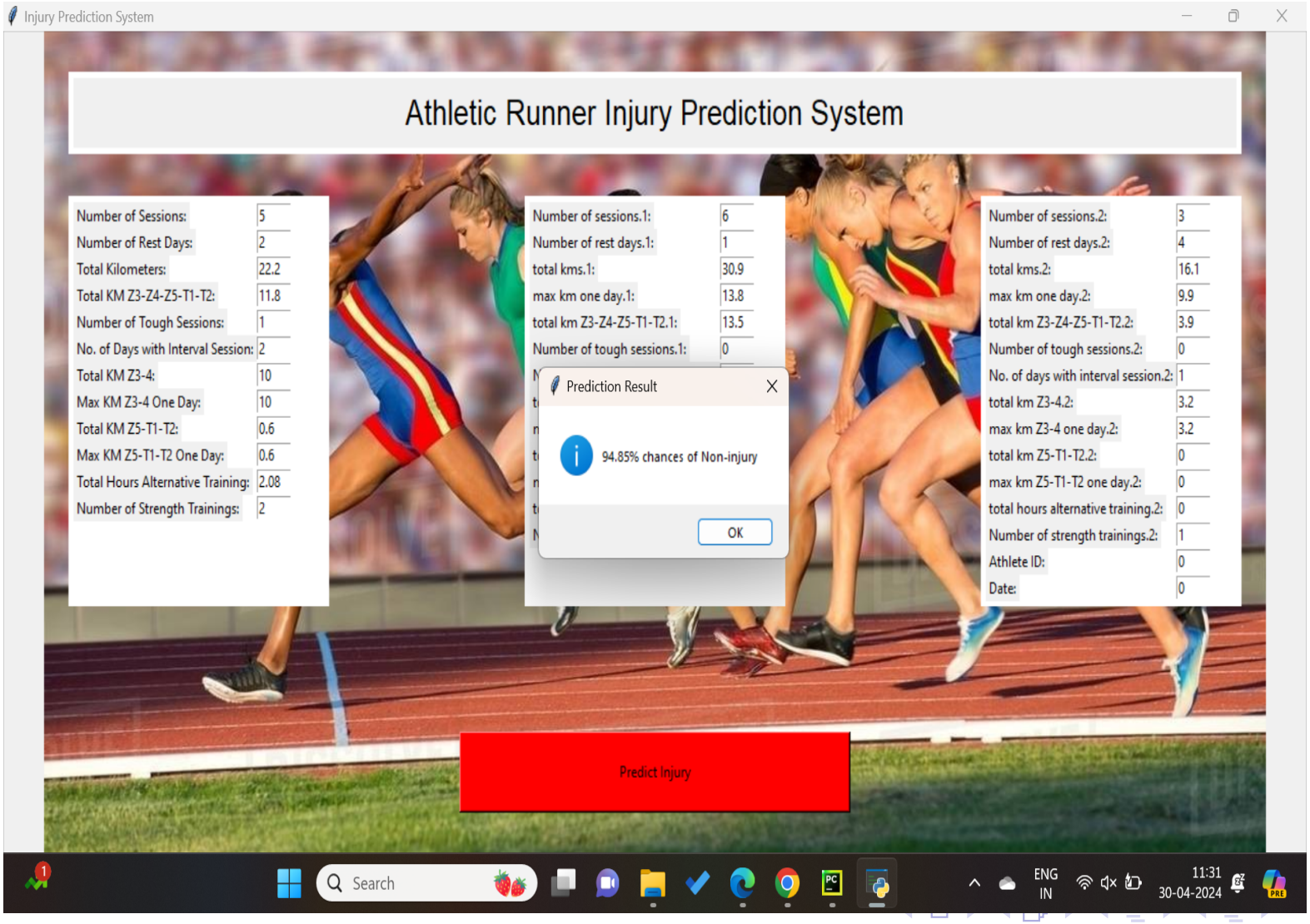
Modules

- User Interface



Integration

User GUI



Results and Discussion

- To address the class imbalance, a subset of instances from the majority class (non-injury) was randomly selected to match the number of instances in the minority class (injury).
- The minority class was augmented by adding 575 instances, resulting in a balanced dataset comprising 1150 instances of both classes. Further augmentation increased the dataset to 1725 instances, then to 2300 instances, and finally to 2875 instances, evenly distributed between injury and non-injury classes.
- Developed using various models such as SVM, Bagging, XgBooster, MLP, Decision tree, RNN and LSTM.
- Appropriate evaluation metrics such as confusion matrix, ROC curve, accuracy, precision, and F1 Score were used to assess the performance of the predictive models.

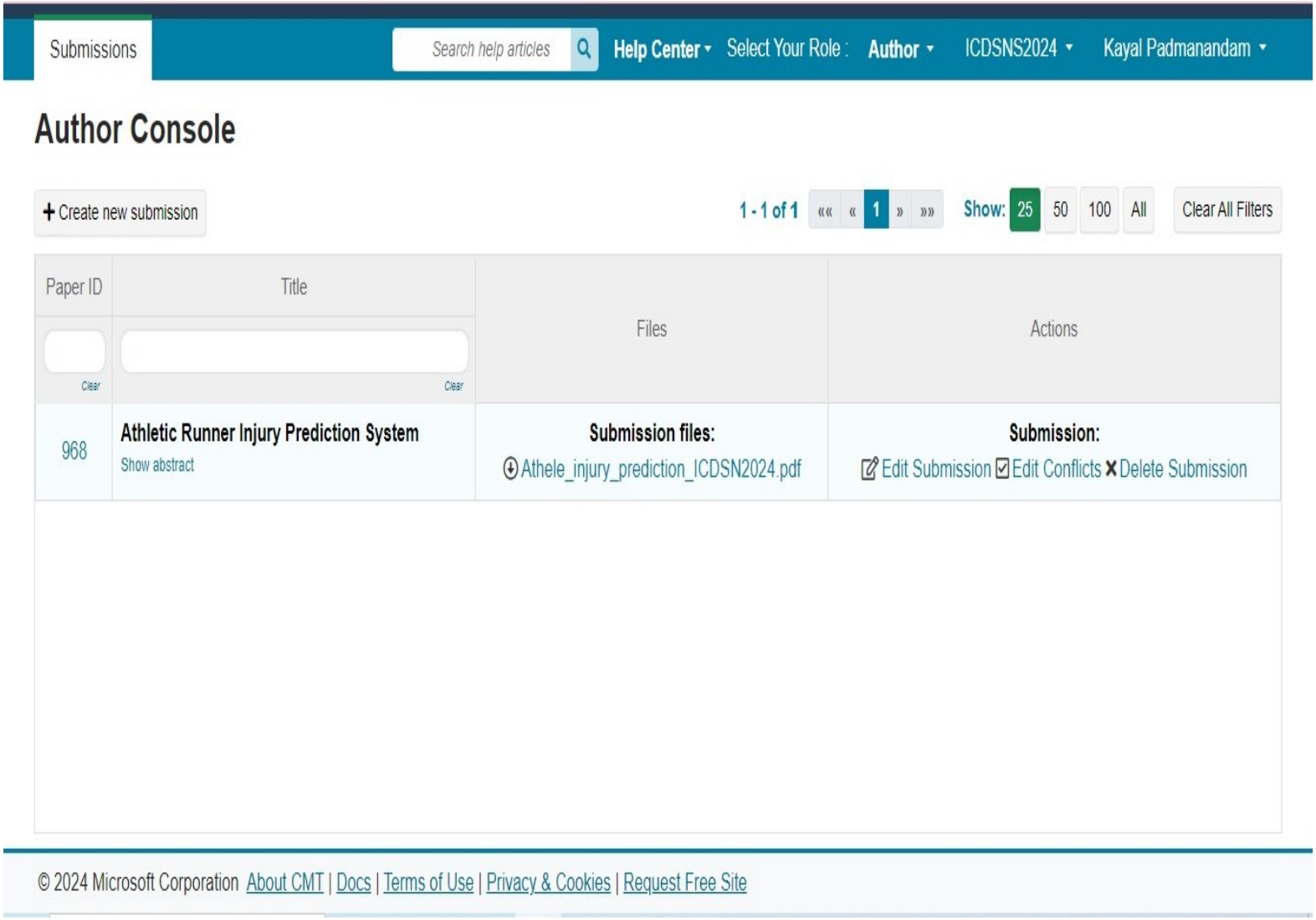
DATASET	SVM			Bagging			XgBooster		
	Accuracy	Precision	F1 Score	Accuracy	Precision	F1 Score	Accuracy	Precision	F1 Score
575*42224	0.94	0.03	0.05	0.98	0	0	0.98	1	0.01
575*575	0.58	0.57	0.6	0.57	0.57	0.6	0.68	0.65	0.71
1150*1150	0.65	0.63	0.67	0.78	0.74	0.8	0.71	0.67	0.74
1725*1725	0.7	0.68	0.71	0.88	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

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

Project Execution

For project execution video click **here**

Submission Proof



R & D Showcase Display

VISHNU UNIVERSAL LEARNING BVRIT H Estd. 2012

BVRIT HYDERABAD College of Engineering for Women

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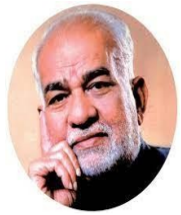
R&D SHOWCASE 2024



Athletic Runner Injury Prediction System

ABSTRACT

Competitive running, with its rigorous training regimens and intense competition, exposes athletes to a heightened risk of injuries that can profoundly impact performance and long-term careers. This system aims to improve the well-being of competitive runners by reducing the risk of injuries, which is in line with Sustainable Development Goals, ensuring healthy lives and promoting well-being for all.

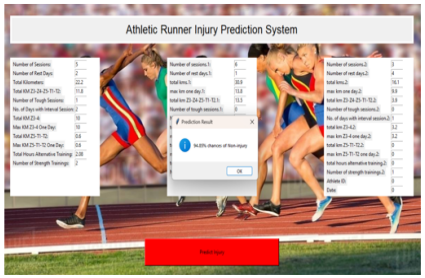
UNIQUENESS

- Risk Prediction
- Biomechanics with Deep Learning

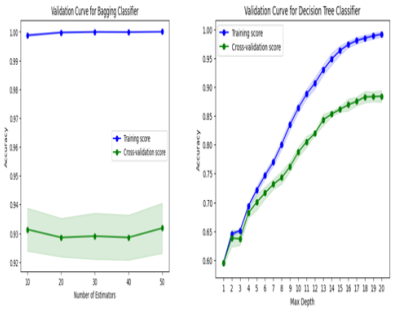
METHODOLOGY

A dataset of 42,799 data points, with 575 injury cases and 42,224 non-injury instances, was preprocessed and visualized to understand its structure and characteristics. SVM, Bagging, XGBoost, Decision Tree, MLP, RNN, and LSTM were employed for injury prediction due to their effectiveness in handling complex patterns and suitability for athletic runner injury prediction.

Athletic Runner Injury Prediction System



Results & Analysis



a)Bagging b) Decision Tree

SOCIETAL USE

The Athletic Runner Injury Prediction System can significantly benefit society by reducing the occurrence of injuries among athletics through early detection and preventive measures. By providing insights into injury risk factors, it enables coaches, trainers and medical professionals to tailor training regimens, implement injury prevention strategies.

CONCLUSION

In conclusion, the proposed project has successfully addressed a critical need in sports science by developing a cutting-edge tool for predicting and preventing injuries. By leveraging comprehensive datasets, and employing ML-algorithms, the system has demonstrated its ability to forecast potential injuries.

REFERENCES

Bullock, Garrett S, Just how confident can we be in predicting sports injuries? A systematic review of the methodological conduct and performance of existing musculoskeletal injury prediction models in sport, Sports medicine 52.10 (2022)

Lovdal, Injury prediction in competitive runners with machine learning, International journal of sports physiology and performance 16.10 (2021)

SDG -03

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Conclusion

- Models trained using Bagging and Decision Tree consistently have shown the defined thresholds for accuracy, F1 score and precision.
- Developed a user-friendly interface which helps predicting injury.
- This system aligns with SDG-3 with aim to improve well-being of competitive runners.

Thank you