

SMDE Assignment

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Abstract—This document is a model and instructions for \LaTeX . This and the `IEEEtran.cls` file define the components of your paper [title, text, heads, etc.]. ***CRITICAL: Do Not Use Symbols, Special Characters, Footnotes, or Math in Paper Title or Abstract.**

Index Terms—component, formatting, style, styling, insert

INTRODUCTION

This document is a model and instructions for \LaTeX . Please observe the conference page limits.

I. PROBLEM DESCRIPTION

We are provided with three marathon results, from a Keggale dataset, on the years 2015, 2016 and 2017. The data is structured in a way that we have the runners' information, the time they took to get to interest points and the time they took to finish the race. Some of the most relevant variables we are provided are: the age, the gender and the city of origin. We believe this characteristics have a direct impact on the performance of the runners.

By reading the paper [1], we concluded that, effectively, enviornmental conditions have a direct impact on the performance of the runners. The paper states that the temperature has a positive impact (longer races) and high humidity and high wind speed have a negative impact on the performance of the runners (faster races).

II. SYSTEM DESCRIPTION, INTRODUCTION

The system to be modeled is the “Barcelona marathon”. A system refers to “A collection of entities, characterized by attributes, that act and interact together toward the accomplishment of some logical end”.

In the Barcelona marathon we have runners of different levels and ages, that come from different cities and have different genres. The marathon is affected by environmental conditions such as rainfall, temperature and wind speed. The runners need supplies such as water, food and medical supplies to finish the marathon. The purpose of the system is to ensure runners complete the marathon while maintaining safety and competitiveness.

This is a fairly simple linear system in which runners advance from one checkpoint to another. At certain points runners need to access resupply points which have limited capacities and an form queues if they aren't able to handle enough capacity. Runners advance from checkpoint to checkpoint until they reach the end of the race. The final times of the runners are also affected by environmental effects like temperature, rainfall and wind speed.

III. MODEL SPECIFICATION

For this model, the entities and attributes are the following:

- **Runners:** The runners are the main entities in the system. They have attributes such as age, genre and city of origin. They interact with the system by running the marathon.
- **Rainfall:** The rainfall is an environmental attribute that affects the performance of the runners. It has attributes such as intensity and duration.
- **Temperature:** The temperature is an environmental attribute that affects the performance of the runners. It has attributes such as intensity and duration.
- **Supplies:** The supplies are the resources that the runners need to finish the marathon. They have attributes such as water, food and medical supplies.

The operations of the model will be reduced to runners arriving at the end line. The processes of the model will be the following:

- **Generate runner:** The model will generate a runner .
- **Begins running:** The runner starts at the starting line and begins running.
- **Ends running:** The runner finishes the race.

In this process, the model will use a normal distributed random variable to determine the time it takes for a runner to finish. We created different time ranges to decide the level of a runner. The “Elite” runners tend to run 5 km in less than 18 minutes, the “hobby” runners take more than 18 minutes and less than 25 and “new” runners take more than 25 minuts.

The model purpose differs from the system purpose. We aim to predict the consequences of the environmental conditions on the performance of the runners. The model will help us understand how the rainfall, heat and other variables affects the performance of the runners.

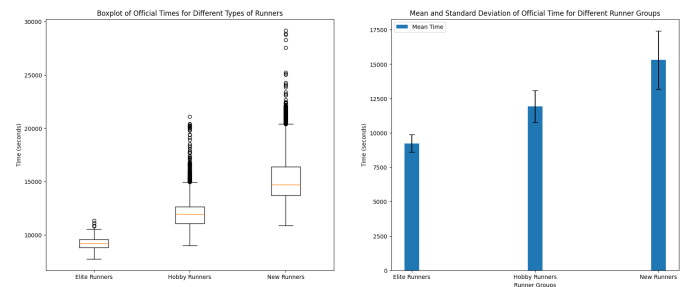


Fig. 1. Standard deviation of race times for elite, hobby, and new runners.

A. Systemic Structural, Systemic Data and Simplifying Hypotheses

IV. CODING

A. Data

V. DEFINITION OF THE EXPERIMENTAL FRAMEWORK

VI. MODEL VALIDATION

VII. RESULTS/CONCLUSIONS

REFERENCES

- [1] B. Knechtle, C. McGrath, O. Goncerz, E. Villiger, P. T. Nikolaidis, T. Marcin, and C. V. Sousa, "The Role of Environmental Conditions on Master Marathon Running Performance in 1,280,557 Finishers the 'New York City Marathon' From 1970 to 2019," *Frontiers in Physiology*, vol. 12, 2021. [Online]. Available: <https://www.frontiersin.org/journals/physiology/articles/10.3389/fphys.2021.665761>. DOI: 10.3389/fphys.2021.665761. ISSN: 1664-042X.

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