

Paper Submission Form - SAIP2025 Proceedings

Sections A, C, D, and E must be completed by all authors (including students) who submit papers. Section B is compulsory for students who submit manuscript(s).

Section A: Paper Submission Information

Paper/Abstract ID	#372
Paper title	The use of Machine Learning techniques to analyse the $gg \rightarrow h \rightarrow Z\gamma$ process within the SMEFT framework at the Large Hadron Collider (LHC).
Corresponding Author Name & Surname:	Kutlwano Makgetha
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Section B: For Students & Supervisors

Supervisor Name & Surname:	Mukesh Kumar
Supervisor Email Address:	mukesh.kumar@wits.ac.za

For this paper, the supervisor must agree/disagree with the following statements.

	Yes	No
1. I am aware that the above-mentioned paper is being submitted for possible publication in the Proceedings of the SAIP Conference. I am satisfied that the presented work is that of the listed authors. I hereby give consent to the submission	X	
2. I have proof-read the manuscript	X	
3. I am satisfied that the manuscript is written in appropriate English and is sufficiently free of grammatical and spelling errors	X	
4. I am familiar with the required manuscript format ("House Style"), and I am satisfied that this manuscript meets the criteria. I am aware that manuscripts not conforming with House Style may be desk rejected	X	
5. I am satisfied that the scientific content of this manuscript is of sufficient standard for it to be considered for publication in the Proceedings of the South African Institute of Physics Conference Proceedings	X	

Student Name & Surname: Kutlwano Makgetha Signature: Date: 31/07/2025

Supervisor Name & Surname: Mukesh Kumar Signature: Date: 31/07/2025

Section C: Suggested Reviewers

Obtaining the two referee reports necessary for DHET subsidy is an onerous task.

Please provide the names and contact details of three qualified South African and/or international referees. Referees should have a PhD and expertise in the relevant area of Physics. Do not recommend referees who have co-authored a work with any of the authors on the manuscript within the past five (5) years. Manuscripts without three recommended referees may be subject to desk rejection.

Suggested Reviewers in your Research Field (Both local & international)

	Reviewer Names & Surname	Reviewer's Email Address(es)
Suggested reviewer #1	Dr Satendra Kumar	satendrak@iit.ac.in
Suggested reviewer #2	Dr Ammar	amari@uhb.edu.sa
Suggested reviewer #3	Dr Vaibhav Rawoot	vaibhavrawoot@gmail.com

Section D: Declaration of Novelty and Use of AI

How is this submitted manuscript scientifically novel?

The scientific novelty of this manuscript lies in its combination of a physics-motivated anomaly ($h \rightarrow Z\gamma$),

a theoretical framework (SMEFT), and techniques such as the XGBoost classifier and the Kernel Density-Estimator. By achieving unprecedented sensitivity through continuous, binning-free significance estimation, and by preparing a pathway to constrain Wilson coefficients in a model-independent way, this work represents significant methodological and phenomenological advance in the search for new physics at the LHC. It exemplifies the next generation of High Energy Physics analyses, where machine learning is not just a tool, but a core component of discovery potential.

Please see the Author Guidelines for the AI use policy.

How was AI used in the generation of this manuscript?

I used AI to create tables, write equations down and run some spelling checks such as grammar polishing and language.

Section E: Plagiarism

	Yes
I am aware that plagiarism detection software may be used on my manuscript.	X