

IT'S OK TO BE SELFISH ... IF YOU'RE THE HIGGS  
BECAUSE WHY STOP AT ONE WHEN YOU CAN HAVE *TWO*?

A DISSERTATION  
SUBMITTED TO THE DEPARTMENT OF PHYSICS  
AND THE COMMITTEE ON GRADUATE STUDIES  
OF STANFORD UNIVERSITY  
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS  
FOR THE DEGREE OF  
DOCTOR OF PHILOSOPHY

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July 2022

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I certify that I have read this dissertation and that, in my opinion, it is fully adequate in scope and quality as a dissertation for the degree of Doctor of Philosophy.

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# Preface

This thesis tells you all you need to know about...

# Acknowledgments

I would like to thank...

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# Chapter 1

## Introduction

- Why we expect new physics in the SM
- Motivation for HH
- Particulars about the 4b final state
- Connection to ML
- Highlight my work on b-tagging
- Thesis organization

## Chapter 2

# Theoretical motivation

- The standard model
- Higgs physics
- BSM physics models
- Ways that we
- Status of the experimental results

## Chapter 3

# LHC

## Chapter 4

# ATLAS

## Chapter 5

# Event reconstruction

## Chapter 6

### **b**-tagging

## Chapter 7

# Statistical techniques

## Chapter 8

# Analysis selection



## Chapter 9

# Background estimation

## Chapter 10

# Results

## Chapter 11

### Future directions?

## Chapter 12

# Conclusions

## Appendix A

# Reweightings loss function

## Appendix B

### Further statistics fundamentals

## Appendix C

# Gaussian Processes

## Appendix D

### ML for jet $\rightarrow$ parton assignment

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