

RECAST Update for Analysis Systems Topical Workshop

Alex Schuy (University of Washington)



2

Who Am I?



Physics/CS double major at the University of Washington



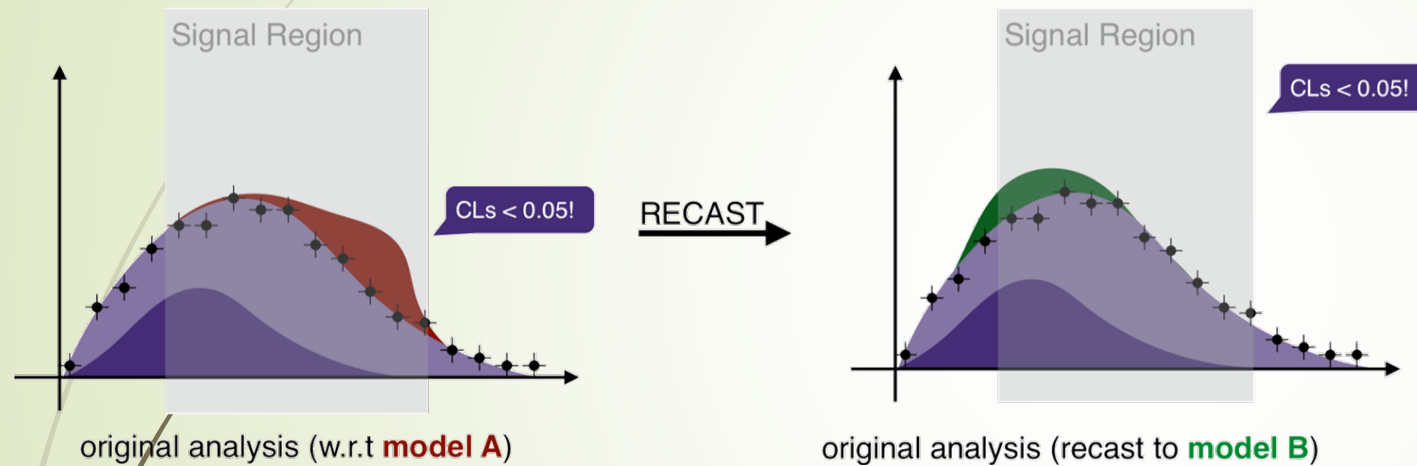
DIANA-HEP Fellow
working on RECAST

1. Inside of ATLAS (recast_atlas on lxplus-cloud)

2. Outside of ATLAS (adding truth-level reinterpretations)

What is RECAST?

- ▶ RECAST is an **analysis reinterpretation framework**. It exists for two reasons:
 1. There are **many theoretical models** that we would like to analyze, but making analyses is **time-consuming**.
 2. Analyses often utilize signatures that make them **sensitive to a wide range of models**, more than are initially explored.



RECAST

- ▶ Idea: Useful limits can be found for a new model by **exploiting an existing analysis with a similar experimental signature**.
- ▶ All we need to do is **generate new signal samples** and pass them + **existing background** into the analysis.

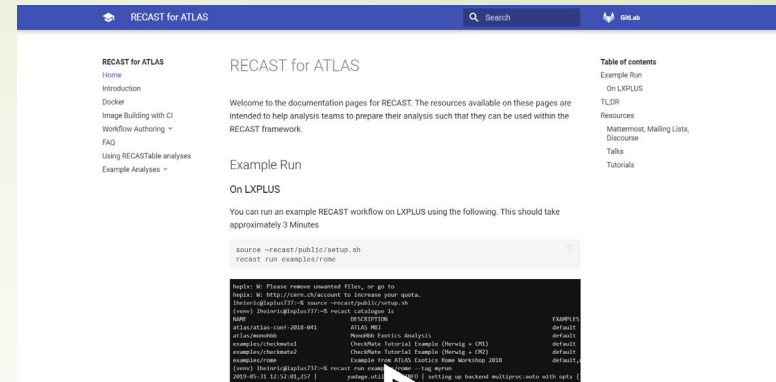
RECAST – How It Works

- To recreate an analysis, three components are necessary:
 - **Software** – what framework(s) does the analysis use and what are the dependencies?
 - **Commands** – what do I need to do to use the framework(s) for each stage of the analysis?
 - **Workflow** – how do I connect the analysis stages?

RECAST – How It Works

- To recreate an analysis, three components are necessary:
 - **Software** – use docker images, the creation of which can be automated on GitLab.
 - **Commands** – Write a ‘spec’ for each stage in Yadage.
 - **Workflow** – Write a ‘workflow’ in Yadage.

RECAST for ATLAS



- Runs on lxplus-cloud machines (or any barebones Kubernetes cluster). Integration with REANA is planned.
 - **Handles authentication** if provided with service account credentials.
 - **Handles parallelization of scans** across the model parameter space.
- Recast atlas docker images now exist, so it is possible to **integrate with GitLab CI**.
- **New docs** at <https://recast-docs.web.cern.ch/>.
 - Walks through the steps to both **create and use** a recast analysis for ATLAS.
 - **Shows examples** from real ATLAS analyses.
 - We hope more people will **try it out** for other analyses and give feedback!

Truth-level Reinterpretations using RECAST

Why Truth?



Full simulation is computationally expensive.



Quickly determine which regions of model parameter space would be most interesting for a full simulation reinterpretation.



Estimate and explore other quantities, such as signal theory uncertainties.

Truth-level RECAST Implementation

- First steps (WIP, aiming for talk at DPF 2019):
 - Implement truth-level RECAST workflow using Rivet and package into command-line tool.
 - Apply to dark sector t-channel model as proof-of-concept.



- Eventual goal:
 - Implement RECAST workflows for different generation and analysis tools (Madgraph/Sherpa, Rivet/CheckMate, etc.).
 - Unify various truth-level workflows and full simulation workflow into a single web-based frontend from which a user can quickly and easily choose and run workflows and retrieve results.

Summary

- ▶ Working on RECAST improvements both inside and outside of ATLAS.
 - ▶ RECAST atlas tools' user experience is improving (again, new docs at <https://recast-docs.web.cern.ch>). The new interface is being used for the monoHbb analysis (aiming for pub note at DM@LHC 2019).
 - ▶ A truth-level framework is being built for RECAST (aiming for talk at DPF 2019) and there are plans for a unified web-based interface.
- ▶ Thanks!