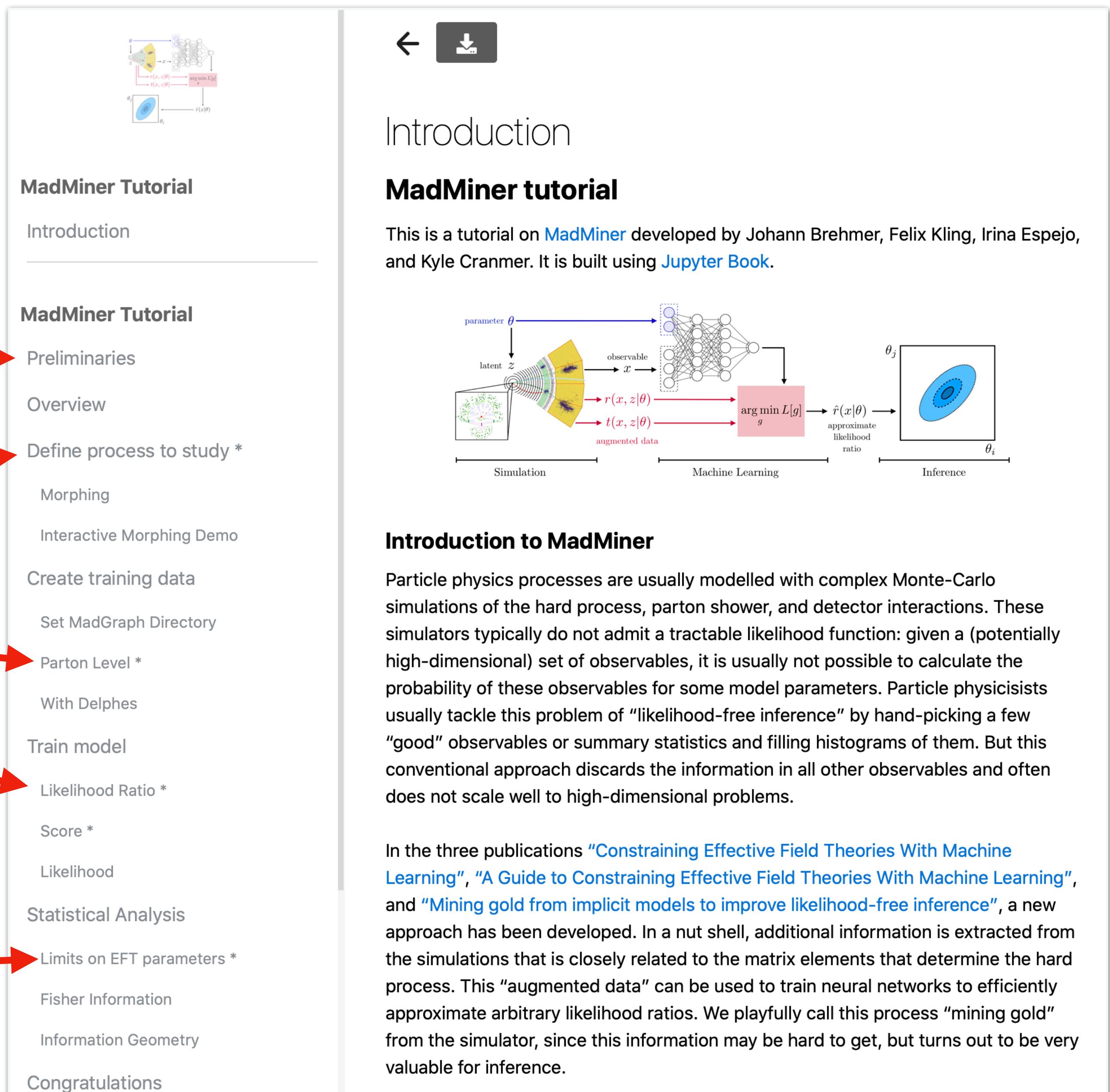


Hands-on Tutorial

- Step-by-step instructions
- Do Preliminaries
 - Need to install Docker
 - And then start Jupyter
- Step 1 is fast
- Step 2 takes ~25 min
- Step 3 takes ~20 min
- While they are running I will lecture
- Then we will finish with results



The screenshot shows the MadMiner tutorial website. The top right corner features a back button, a download icon, and the URL <https://cranmer.github.io/madminer-tutorial/>. The main content area is divided into three sections: **Introduction**, **MadMiner tutorial**, and **Introduction to MadMiner**.

Introduction section:

- MadMiner Tutorial
- Introduction

MadMiner tutorial section:

- MadMiner Tutorial
- Preliminaries
- Overview
- Define process to study *
- Morphing
- Interactive Morphing Demo
- Create training data
- Set MadGraph Directory
- Parton Level *
- With Delphes
- Train model
- Likelihood Ratio *
- Score *
- Likelihood
- Statistical Analysis
- Limits on EFT parameters *
- Fisher Information
- Information Geometry
- Congratulations

Introduction to MadMiner section:

This is a tutorial on **MadMiner** developed by Johann Brehmer, Felix Kling, Irina Espejo, and Kyle Cranmer. It is built using **Jupyter Book**.

The diagram illustrates the workflow of MadMiner:

- Simulation:** A parameter θ is input into a "latent z " space, which then generates an "observable x ".
- Machine Learning:** The observable x is used to create "augmented data". This data, along with the parameter θ , is used to train a neural network. The network outputs the likelihood ratio $r(x|z|\theta)$ and the approximate likelihood ratio $\hat{r}(x|\theta)$.
- Inference:** The approximate likelihood ratio $\hat{r}(x|\theta)$ is used to find the minimum of the likelihood function $\arg \min_g L[g]$, resulting in the inferred parameter θ_i .