

1. Setting up the environment

- ▶ Navigate to the CYTools website and follow installation docs to set up.
- ▶ Download and launch the `tutorial.ipynb`.

2. Kreuzer–Skarke consistency check

- ▶ Query the KS database for a *favorable* polytope where, e.g., $h^{1,1} = 11$.
- ▶ Extract its Hodge numbers ($h^{1,1}$ and $h^{2,1}$).
- ▶ Calculate its Euler characteristic using $\chi = 2(h^{1,1} - h^{2,1})$. Verify that it matches the built-in method output.
- ▶ Show that $(h^{1,1}, h^{2,1}) = (11, 22)$ has a 2d subpolytope while $(1, 145)$ does not <https://arxiv.org/abs/1809.05160>.

3. Stretched volume hunt

- ▶ Construct a standard 4D simplex reflexive polytope: $[[1,0,0,0], [0,1,0,0], [0,0,1,0], [0,0,0,1], [-1,-1,-1,-1]]$.
- ▶ Triangulate it and extract the Calabi-Yau object.
- ▶ Locate the tip of the stretched Kähler cone for a baseline parameter value of $c = 1$, and then scale it tenfold to 10.
- ▶ Compute volumes at both tips. Observe the scaling law and explain it based on Calabi-Yau 3-fold dimensionality.