Motivated by the upgrade of the STAR experiment with the high-precision silicon vertex detectors we reviewed the existing vertex finding algorithms currently employed by the STAR collaboration.

To help with evaluation and comparison of the vertex finders we developed a generic tool, Travex, that can be used to address similar tasks by other experiments.

We enhanced the STAR vertex finders by implementing 3D fits to primary vertices with proper beamline constraint and reporting of real uncertainties.

There is a strong indication that our improvements can benefit certain physics analyses relying on topology cuts for secondary vertex decays.

In \( \Lambda \)-enriched sample with realistic pile-up we observed an improvement in \( S/B \) of \( \sim 10\% \).

\[ \Sigma = \frac{L}{\sigma_L} \]

3D fit w/o beamline
3D fit w/ beamline

cut on secondaries