Chapter 6
Conclusion

This Ph.D. thesis covered four major topics.

The Belle to Belle II Conversion package (`b2bii`) enables Belle II physicists to analyze the dataset recorded by Belle using `BASF2`. Thus, the entire Belle II analysis software stack was validated on recorded data, years before recorded data from the Belle II experiment was available.

The multivariate analysis package (`mva`) enables Belle II physicists to keep up with the rapid developments in the field and to easily employ modern machine learning algorithms in their work. Most of the multivariate methods used in the reconstruction and analysis algorithms in `BASF2` are built on the `mva` package and use the default classification method `FastBDT`, both developed during this thesis.

The Full Event Interpretation algorithm (`FEI`) enables Belle II physicists to measure a wide range of interesting decays with a minimum amount of detectable information. The `FEI` more than doubles the tag-side efficiency compared to its (already very successful) predecessor.

The $B \rightarrow \tau\nu$ benchmark analysis validated the entire Belle II analysis software stack. Unresolved reconstruction issues in the Belle II framework and previously unknown background contributions were discovered before Belle II started recording data. It successfully reproduced the previous results reported by Belle. The analysis serves as a prototype for other current (using `b2bii`) and upcoming exclusively tagged analyses.

All software packages developed during this thesis were validated on data and are used in production by Belle II physicists all over the world.