

Bela AI Toolbench

This talk will be a presentation providing an overview and progress report on the development of tooling for embedded AI on the Bela board that is being worked on in collaboration with the Intelligent Instruments Lab as part of Google Summer of Code. The specific developer tools being worked on for this project are an inference benchmarking tool as well as a perf-based profiler developed for the Bela platform. This project aims to extend the Bela platform to include these new tools and documentation for machine learning projects, with the goal of simplifying the process of integrating machine learning models into real-time embedded Bela projects. One of the current challenges in doing so is the real-time nature of audio projects on the Bela, which is a key factor when developing instruments or interactive sensor systems. This strict latency requirement implies the need for performance analysis tools that can evaluate and measure ML models, providing feedback to the designer on the runtime costs incurred by their models. Thus, this project's main focus is the development of performance analysis tools for running machine learning models on the Bela. The benchmarking tool being developed will measure latency, memory and accuracy measurements, meant to be used when comparing different ML runtime components, model architectures and/or compilers. The profiler being developed could be used to pinpoint bottlenecks during model development, allowing developers to discover slow operators and view CPU utilization. In addition to these tools, this project also aims to build some exemplary projects that document the setup of ML projects on the Bela. This collection of tools will hopefully foster further exploration of embedded AI with a focus on maximizing the available computational resources. The talk will further expound on the development of these tools including the architecture and design of the tools, currently supported components and libraries, supported hardware platforms, project goals and future plans.