**Recommendation Letter**

I am pleased to recommend Bhavana Manikyanahalli Srinivasegowda, a student in my ECE 410/510 class at Portland State University. Bhavana has shown a strong interest in learning about advanced computing systems and has consistently put in the effort to understand and apply complex ideas. Her dedication, curiosity, and ability to work independently make her a great candidate for any opportunity she pursues.

In Weeks 1 and 2, Bhavana took on some tough and interesting challenges. In Week 1, she explored how large language models like ChatGPT can help design neural chips and looked at how different Python programs run and where they slow down. In Week 2, she built simple neural networks like perceptron, trained them to solve logic problems, and even made visualizations to show how they learn. She worked independently, stayed focused, and showed a strong interest in learning and building things on her own.

In Weeks 3 and 4, she worked on identifying performance bottlenecks in reinforcement learning code and explored ways to speed it up using GPUs and hardware design. She tested both Python and GPU versions of the FrozenLake algorithm and compared their performance. She also learned CUDA basics by benchmarking large-scale computations like SAXPY and wrote a CUDA program to generate Fibonacci numbers. Bhavana showed strong problem-solving skills and a steady interest in learning new tools for performance improvement.

In Weeks 5 and 6, she explored performance benchmarking and hardware modeling through hands-on projects. She compared custom CUDA implementations on Google Colab and looked into hardware-friendly designs like systolic arrays for sorting. She continued to deepen her understanding of neuromorphic computing by implementing a binary spiking neuron in Verilog and simulating matrix-vector multiplication using a resistive crossbar in SPICE.

In Weeks 7 and 8, Bhavana continued to expand her skills in neuromorphic computing and hardware-software integration. She explored large-scale neuromorphic systems, studied current research trends, and reflected on future directions in the field. She also worked on bridging Python and Verilog through co-simulation using cocotb, building an SPI interface for mixed hardware/software setups. These weeks highlighted her ability to handle both high-level concepts and low-level technical implementations with focus.

In Weeks 9 and 10, she explored advanced topics in neuromorphic engineering, including edge AI architectures and synaptic device modeling. She studied real-world neuromorphic hardware like BrainChip’s Akida and gained hands-on experience modeling memristors, which are key components in brain-inspired systems. Bhavana approached these challenges thoughtfully, showing a solid grasp of both the theory and practical aspects of emerging technologies.

For the final project, she chose to design and implement a custom hardware accelerator for a genetic algorithm, demonstrating strong initiative in exploring hardware-software co-design. She analyzed the algorithm, identified the bottlenecks, and offloaded those into hardware using Verilog. To test and verify her design, she used **cocotb**, a Python-based co-simulation framework, which allowed her to simulate and debug the interaction between her software and hardware modules. She also synthesized her design using **OpenLane**, an open-source ASIC toolchain, and worked through various iterations to improve performance, evaluate timing, and extract real hardware metrics like maximum frequency. Throughout the project, she applied a thoughtful and methodical approach—benchmarking, profiling, testing edge cases, and validating her accelerator against a software reference model. While much of the coding was done using vibe coding with the help of large language models, she showed strong problem-solving skills and a clear understanding of system-level integration, which was key to making the project work across both hardware and software domains.

Bhavana’s ability to stay focused, adapt to new tools, and push through technical challenges has been impressive throughout the course. I believe she will bring the same level of dedication and curiosity to any future role or project.