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ECE 410/510: Hardware for AI and ML

Week 6: Recap, outlook, and reminders

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What did you learn last week?

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Recap

- No free lunch theorem (no algorithm consistently outperforms random search or any other algorithm).
- TPU (matrix multiplication + activation unit)
- Systolic array
- Mapping a neural net on a systolic array
- Transformers (encoder, decoder): main operations
- NVIDIA transformer engine: dynamically adjusts precision

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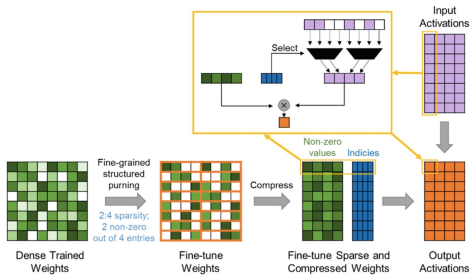
Pruning



Mishra et al.

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Week	Monday	Wednesday (Codefest)
2	HW/AI/ML overview + codesign overview	Start main project: pick workload, start analysis, benchmark, …
3	GPU architecture and programming for AI	Drafting a HW architecture, creating a model
4	Deep neural networks on GPUs	Coding HW description
5	Transformers on GPUs	First simulation + refinement
6	In-memory computation	Improving initial design
7	Neuromorphic chips: TrueNorth, Loihi, Akida	Simulation + refinement
8	Neuromorphic computing with mem-devices	Synthesizing design + benchmarking
9	Hardware accelerators for embedded systems	Final improvements
10	Emerging technologies and future directions	Final tests, validation, verification, benchmarking

Memorial Day

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This week

Monday
- Ways to accelerate an algorithm
- Transformers: to spike or not to spike
- In-memory computing

Wednesday
- Codefest #6: Rinse and repeat?

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