



AI/ML at ICC

And how COSMA can help

ICC Theory Lunch

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AI

- Mimic cognitive functions
 - Learning, problem solving
- Tasks difficult to perform programmatically
 - Or demonstrating improved performance
- Problem solving, knowledge representation, planning, learning, language processing, perception, motion, social capability, general intelligence

ML

- Algorithms that improve through experience
 - Building a model based on training data
 - aims to solve practical problems based on statistics and probability theory
- Some debate as to whether a sub-field of AI

AI on COSMA

- Standard AI libraries
 - TensorFlow, PyTorch, etc
 - Mostly Python-based
- Hardware currently all CPU
 - 10-GPU system on its way (V100 32GB)
 - 2x 3-GPU (AMD MI50) on its way
- COSMA-8: 128 cores per node
 - >8TFLOPS per node (>14TFLOPS theoretical)

My AI involvement

- Beginning 2012, seeing improvements using adaptive optics
 - ANNs used to predict atmospheric turbulence structure
 - 4.2m William Herschel Telescope, CANARY
 - Developing hard real-time ANN libraries in C
 - Ongoing CfAI / U. Oveido collaboration
- More recently, MISCADA student projects
 - Using AI for HPC error detection



ICC/COSMA involvement

- – Deep learning architectures
- – Machine learning, fast emulators of Galform
- – CNN / Hyperparameter searches
- – CNN for image recognition (TensorFlow/PyTorch)
- – Identifying footprints of DM haloes from strong lensing images
- Others (external to ICC)
 - Probably some I don't know about (apologies... please speak up!)
 - (CfAI)
 - Milan – ScikitLearn
 - Leiden – Background subtraction

Topics for debate

- AI sub-group?
- Dedicated AI hardware?
 - DiRAC GPU system at Cambridge
 - Should COSMA acquire GPUs?
 - Would they be well used
 - How many?
 - How many per node?