

MICHIGAN STATE

U N I V E R S I T Y

Alpha Presentation

SmartSat™ AI Acceleration in Space

The Capstone Experience

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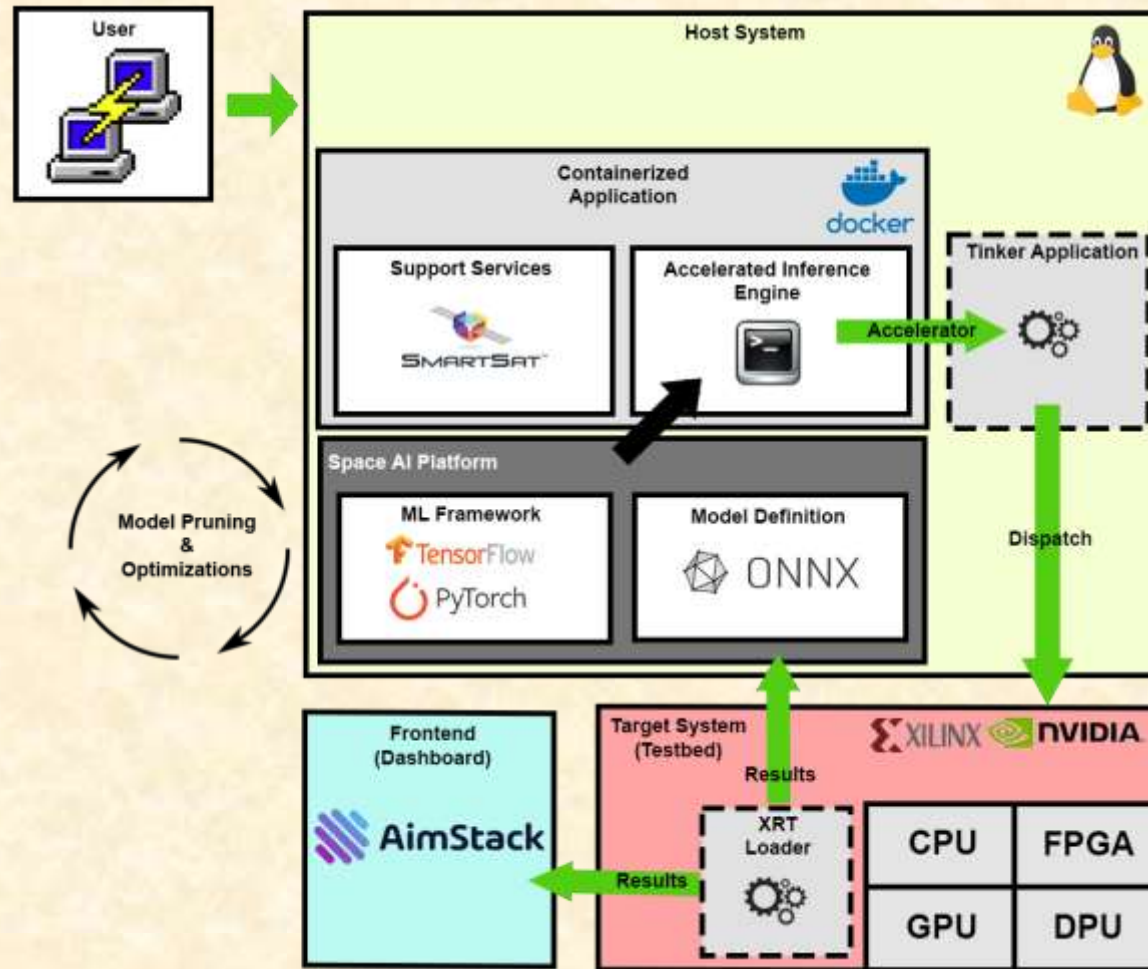
*From Students...
...to Professionals*

Project Overview

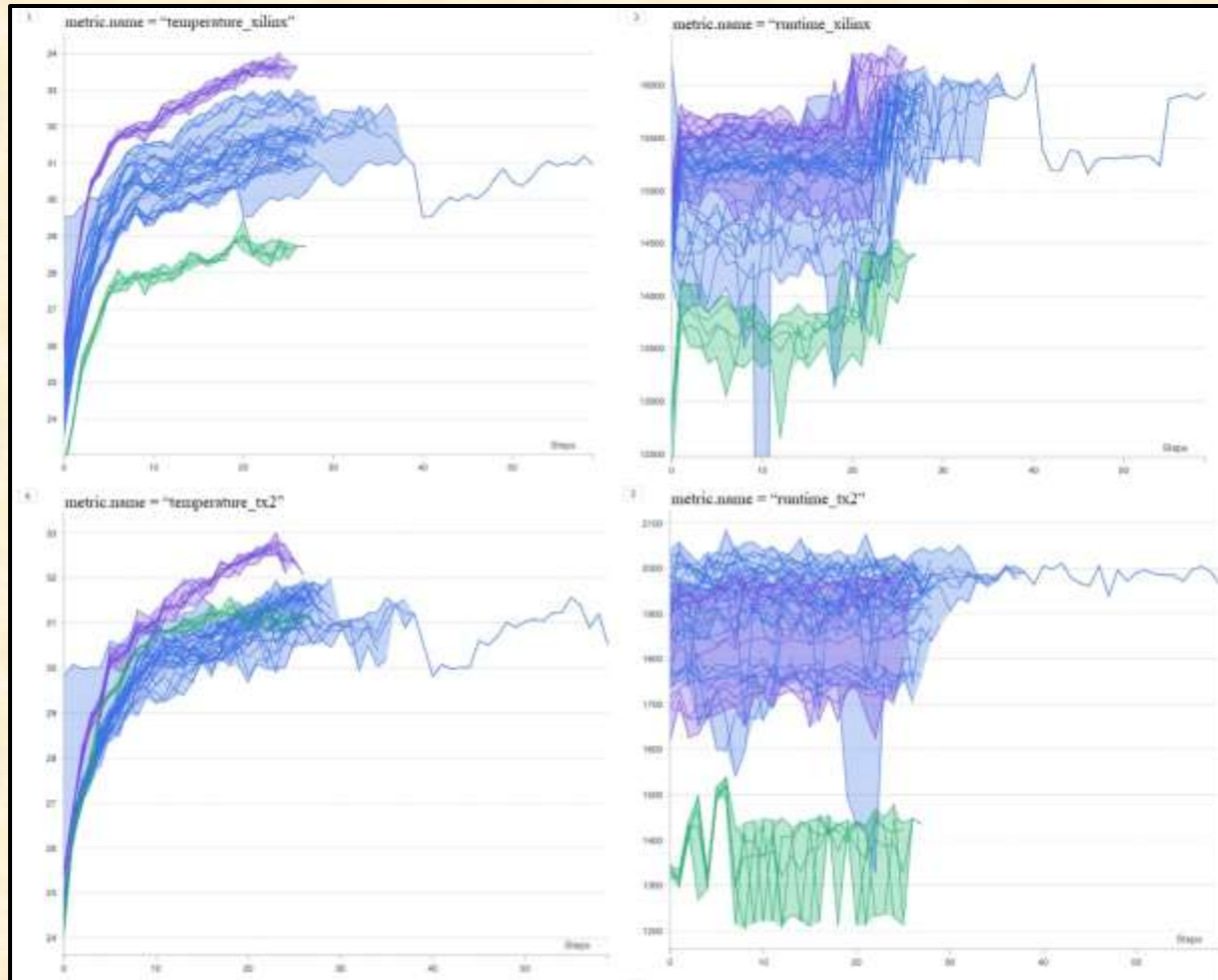
- Develop a benchmark script to test different machine learning models
- Collect data by using previous semester's XRT manager
- Deploy scripts remotely using Tinker application
- Configure ZCU102 to run scripts on boot automatically
- Display results onto a dashboard



System Architecture



Dashboard



PetaLinux Boot Terminal

```
COM5 - PuTTY
Starting Network Name Resolution...
[ OK ] Started Network Name Resolution.
[ OK ] Reached target Network.
[ OK ] Reached target Host and Network Name Lookups.
[ OK ] Started NFS status monitor for NFSv2/3 locking..
Starting Permit User Sessions...
Starting Target Communication Framework agent...
[ OK ] Started Xinetd A Powerful Replacement For Inetd.
[ OK ] Finished Permit User Sessions.
[ OK ] Started Getty on tty1.
[ OK ] Started Serial Getty on ttyPS0.
[ OK ] Reached target Login Prompts.
[ OK ] Started Target Communication Framework agent.
[ OK ] Started dpu-auto-config.service.
[ OK ] Reached target Multi-User System.
[ OK ] Reached target Graphical Interface.
Starting Record Runlevel Change in UTMP...
[ OK ] Finished Record Runlevel Change in UTMP.

PetaLinux 2022.2_release_S10071807 xilinx-zcu102-20222 ttyPS0
xilinx-zcu102-20222 login: root (automatic login)

root@xilinx-zcu102-20222:~#
```



Board



Script Execution

```
COM5 - PuTTY
images script.py          script2.py testingImages
root@xilinx-zcu102-20222:~/kellen_test# python3 script2.py
{name: 'quantize_eval_model', op_num: 190, attrs: {'libs_info': {'xcompiler.3.5.0': 'be7bc16b739398070b4526571b1d251757bf0e57', 'xcompiler.3.5.0 : target-factor-y.3.5.0': '947d287c09dadab682bealc60ae5edf21fbcbe64', 'xcompiler.3.5.0 : xir.3.5.0': 'ea490eebe8414766bebf74622ca6bff0ea57b6d8'}, 'files_md5sum': {'/tmp/resnet50_tf_DPUCZDX8G_ISA1_B4096_org.xmodel': '2999d5e6493adc3bf084c781a76eea91', '/workspace/tf_resnetv1_50_imagenet_224_224_6.97G_3.0/quantized/quantize_eval_model.pb': 'c8556b51ac404197e0766d33ef513edb'}, 'origin': 'tensorflow'}}
input size = (1, 224, 224, 3)
/home/root/kellen_test/testingImages/images/2.jpeg
/home/root/kellen_test/testingImages/images/4.jpeg
/home/root/kellen_test/testingImages/images/1.jpeg
/home/root/kellen_test/testingImages/images/3.jpeg
/home/root/kellen_test/testingImages/images/0.jpeg
corkscrew, bottle screw
marimba, xylophone
lycaenid, lycaenid butterfly
badger
folding chair
Total Runtime: 5.86 seconds
Average Latency: 0.01 seconds
Throughput: 85.27 inferences/second
root@xilinx-zcu102-20222:~/kellen_test#
```



What's left to do?

- Develop benchmarks using Lockheed Martin given models
- Jetson TX2 GPU passthrough
- Integrate XRT with our scripts
- Write script that runs automatic benchmarking
- Install packages on ZCU102 on root pre boot



Questions?

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