

1 **Script for GraphCast demonstration (Imm version)**

2 *ATM419/563 Spring 2024*

3

4 **IMPORTANT:** Log onto **Imm.rit.albany.edu** with your **UAlbany NetID and**  
5 **password.**

6

7 This demonstration involves the Google GraphCast machine learning weather  
8 prediction model, operated through ECMWF's ai-models front-end

9

10 • **we need the NEW libraries**

11 \$ new

12

13 \* ----- **preliminaries (only done once)** ----- \*

14 • move to your atm419 lab space

15 • we need to install anaconda python

16

17 \$ wget https://repo.anaconda.com/archive/Anaconda3-2023.09-0-Linux-x86\_64.sh

18 \$ bash Anaconda3-2023.09-0-Linux-x86\_64.sh

19 → hit space bar repeatedly to scroll through license, finally type *yes*

20 → when asked, specify install directory as

21     /network/rit/lab/atm419lab/**yourlastname**/anaconda3

22 → Do you wish to update your shell profile to automatically initialize conda?

23     **no**

24

25 • activate your new conda, create and populate a new environment "ai"

26

27 \$ source /network/rit/lab/atm419lab/**yourlastname**/anaconda3/bin/activate

28 \$ conda create -n ai

29 \$ conda activate ai

30 \$ conda install python=3.10

31 \$ pip install ai-models

32 \$ pip install ai-models-graphcast

33 \$ pip install flax

34 \$ pip install jax==0.4.23

35 \$ pip install jaxlib==0.4.23

36

37 • make a new directory and move into it

38 \$ mkdir GRAPHCAST

39 \$ cd GRAPHCAST

40

41 • get the graphcast model

42 \$ git clone <https://github.com/ecmwf-lab/ai-models-graphcast>

43

44 • This creates the new directory ai-models-graphcast. Move into it

45 \$ cd ai-models-graphcast

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46
47 • we are installing the non-gpu version
48 $ pip install -r requirements.txt
49
50 • copy model data, including training data
51 cp -rf /network/rit/lab/atm419lab/GRAPHCAST/params .
52 cp -rf /network/rit/lab/atm419lab/GRAPHCAST/stats .
53
54 * ----- running the model ----- *
55 • you are in your $LAB/yourlastname/GRAPHCAST/ai-models-graphcast directory
56 • execute model. THIS IS ALL ONE SINGLE LINE
57
58 $ ai-models --input file --file $LAB/GRAPHCAST/ERA5_2021123012.grib --date
59 20211230 --time 12 --path 'out-{step}.grib' --lead-time 18 graphcast
60
61 → The file ERA5_2021123012.grib contains a subset of ERA5 reanalysis fields from
62 06 and 12 UTC 12/30/2021. GraphCast requires two initialization times 6 h apart
63
64 • Model run takes about 10 min (absent resource competition)
65 • You will see some complaints like this. Ignore them
66
67 2024-04-24 10:49:30,062 INFO Unable to initialize backend 'cuda':
68 2024-04-24 10:49:30,062 INFO Unable to initialize backend 'rocm': module
69 'jaxlib.xla_extension' has no attribute 'GpuAllocatorConfig'
70 2024-04-24 10:49:30,063 INFO Unable to initialize backend 'tpu': INTERNAL: Failed
71 to open libtpu.so: libtpu.so: cannot open shared object file: No such file or directory
72
73 • When you see something like the below, the model is wrapping up
74
75 2024-04-24 10:56:35,856 INFO Doing full rollout prediction in JAX: 7 minutes 5
76 seconds.
77 2024-04-24 10:56:35,856 INFO Converting output xarray to GRIB and saving
78
79 • At the end of the model run, the output files are created, all at once
80     → outputs will be out-0.grib, out-12.grib, out-18.grib, out-6.grib
81     → they are GRIB2 files
82
83 * ----- analyzing the output ----- *
84 • Open a second session and log into headnode7.rit.albany.edu
85 • move to your GRAPHCAST directory
86 • we will combine the model outputs into a single GRIB2 file “combined.grib2”
87
88 $ old
89 $ grib_copy out-0.grib out-6.grib out-12.grib out-18.grib combined.grib2
90

```

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91 • copy the notebook
92 $ cp $LAB/GRAPHCAST/GRIB_plot_GC.ipynb .
93
94 • launch ARCC Jupyterlab. Batch or snow. Minimal resources suffice.
95 • execute notebook
96
97 • If you cannot run the model for some reason, you can edit the notebook to point to
98 the pre-made output file:
99 /network/rit/lab/atm419lab/GRAPHCAST/combined.grib2
100
101 * ----- running the model in the future ----- *
102
103 • To run the model in the future, this is all the setup you need
104 $ source /network/rit/lab/atm419lab/yourlastname/anaconda3/bin/activate
105 $ conda activate ai
106 → go to your GRAPHCAST/ai-models-graphcast and proceed
107
108
109 * ----- next steps (on your own) ----- *
110 (1) you need to establish an account on ECMWF CDS
111     https://cds.climate.copernicus.eu/api-how-to
112 (2) then you can run ai-models-graphcast fetching ERA5 data from CDS
113     → this can be very, very slow to retrieve data from CDS
114     nohup ai-models --input cds --date 20211230 --time 12 --path 'out-
115 {step}.grib' --lead-time 18 graphcast &
116     → The “nohup” is so you can log off if need be
117 (3) get it working on GPU instead so it runs very fast!!!
118
119 {Coureurs des GraphCast}

```