Kick-off Meeting (Online)

November 16, 2023, 14:00~17:00 PM

- 02:00PM - 02:05PM: Welcome and event overview (Jay, CK)
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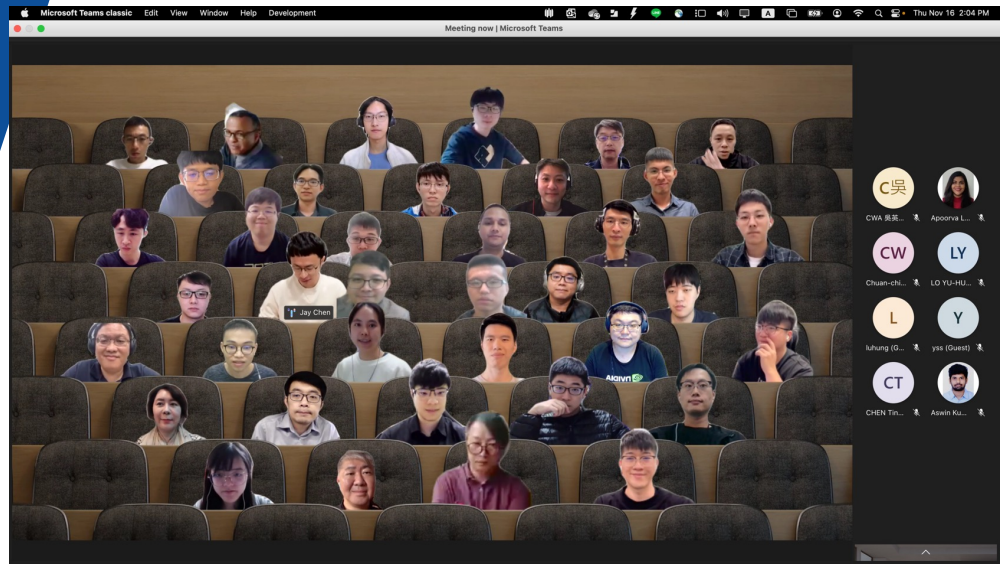
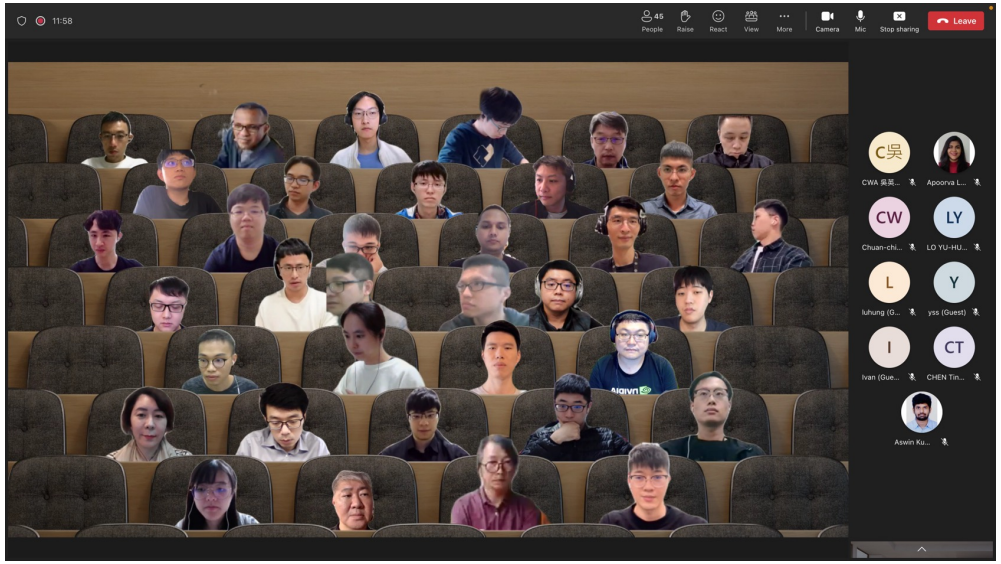
Group Photo





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National Center for High-performance Computing

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Team Roster

Group Blue (Host by Jay)

Group Green (Host by CK)

Host	Jay	**Floating Mentor**	Bharat, Aswin
Host	CK	**Marketing**	Jinny
Infra Setup	Kuan-Ting	**Event logistics**	Apoorva
Account Manager	Vincent	**NCHC Contact Window**	Zhoujin Wu

7 HPC teams across
- Quantum Algorithms
- DPU&Infra Security
- Compute Fliud Dynamic
- Climate&Weather
  MPAS Mesh, GFS, GVER

5 AI teams across
- Otoscopic Diagnostic
- Heartbeats Detection
- X-ray Image Correction
- Functional Encryption
- Large Language Model

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Team ID	Team	Mentor	HOST
1	Schrödinger's cat	Reese Yun-Yuan	CK
2	haofan2023	Tian Frank Yun-Yuan	CK
3	NTHU-LSALAB	Erez Ferber Sungta	CK
4	NTUST CFD Lab	Shijie Kuan-Ting	Jay
5	CWA- mesh genration for MPAS model	Leo Jay (Host)	Jay
6	CYCU BME	 Eason	CK
7	CWA_GVER	Ming Kuan-Ting	Jay
8	WTMH	 Ken	CK
9	氣象署-興大應數聯隊 (氣興聯隊)	Leo Jay (Host)	Jay
10	YSS	Frank Tian CK (Host)	CK
11	TXM_AI_group	 Warren	Jay
12	NCHC Speedrunning team	Anthony Cliff	Jay

2023 NCHC Open Hackathon

- Day 0 (Nov 16)
- Day 1 (Nov 23)
- Day 2 (Nov 30)
- Day 3 (Dec 07)

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OPENACC – CELEBRATING 12+ YEARS

Building Community.





Ecosystem Development

Training/Education

OpenACC Specification

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2021 NCHC Open Hackathon

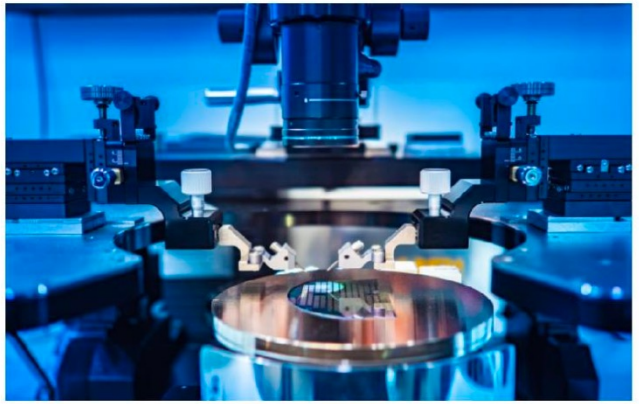
【NVIDIA 在台灣辦了一場黑客松】看 GPU 把地球科學、工廠產線排程等不同任務，通通加速！

NVIDIA 在台灣舉辦了一場熱血線上黑客松，從產業升級到基礎科學研究通通可以加速！

NVIDIA 2022-01-05

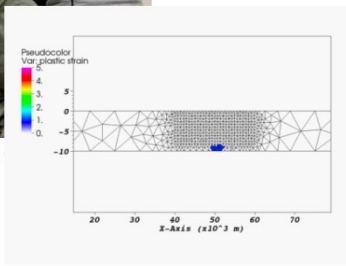
智慧製造的關鍵項目，產線智慧排程如何優化？

由林群惟博士、蘇粲程博士所帶領的團隊「AI Scheduler」，首度參與本屆黑客松，就透過 GPU 加速找到未來商品優化的方向。



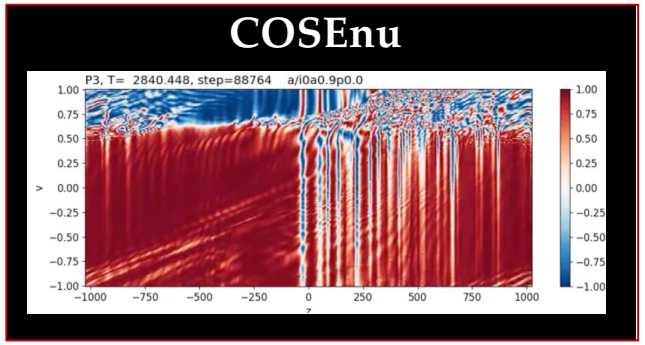
GPU 加速深化台灣地球科學研究成果，提升全球學術圈重要性

譚老師團隊照片，譚誾（圖中）帶領團隊參與本次 NVIDIA 黑客松，找到地質研究的運算新方法

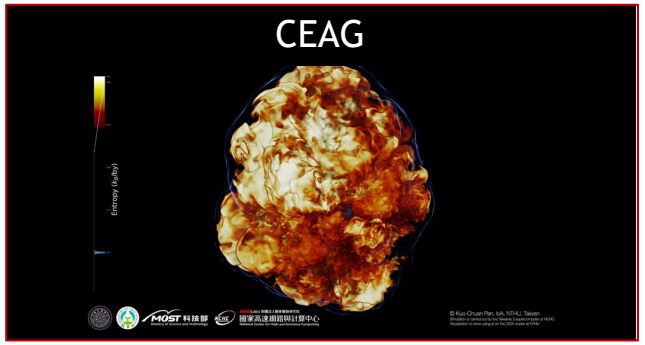


https://buzzorange.com/techorange/2022/01/05/nvidia-2021-taiwan-gpu-hackathon/

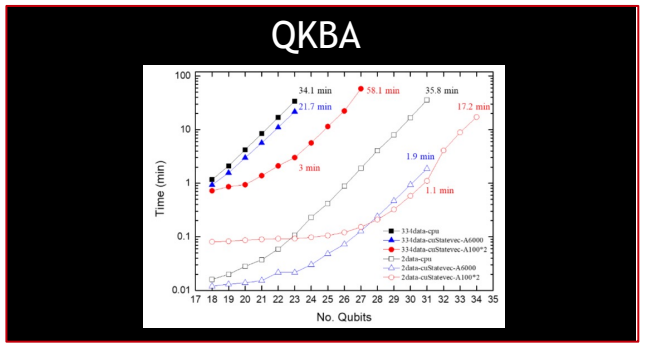
2022 NCHC Open Hackathon



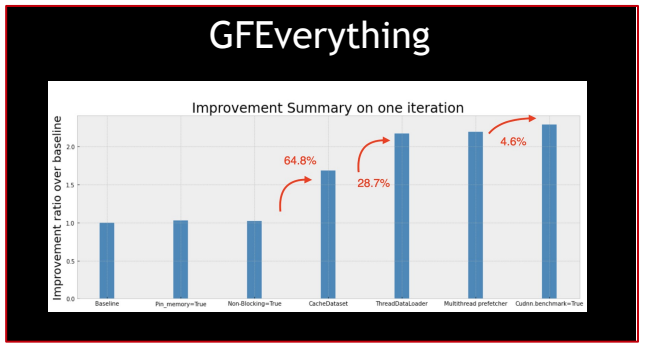
novel neutrino transport mechanism
Accelerate 7X by OpenACC @ GSI, SINICA, NCHC



core-collapse supernova shock
Accelerate 10X by OpenACC @ NTHU



predict tumor metastasize by QSVM
Accelerate 33X by cuQuantum @ NSRRC, NYCU, AU, ICL



medical semantic segmentation by HarDNet
Accelerate 2X by MONAI @ NTHU

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Open Hackathon Objectives

Connect	Accelerate	Celebrate
Developers & Mentors Apps & Acceleration	Speedup Energy Efficient	Publication, Paper Ack Blogs and Talks

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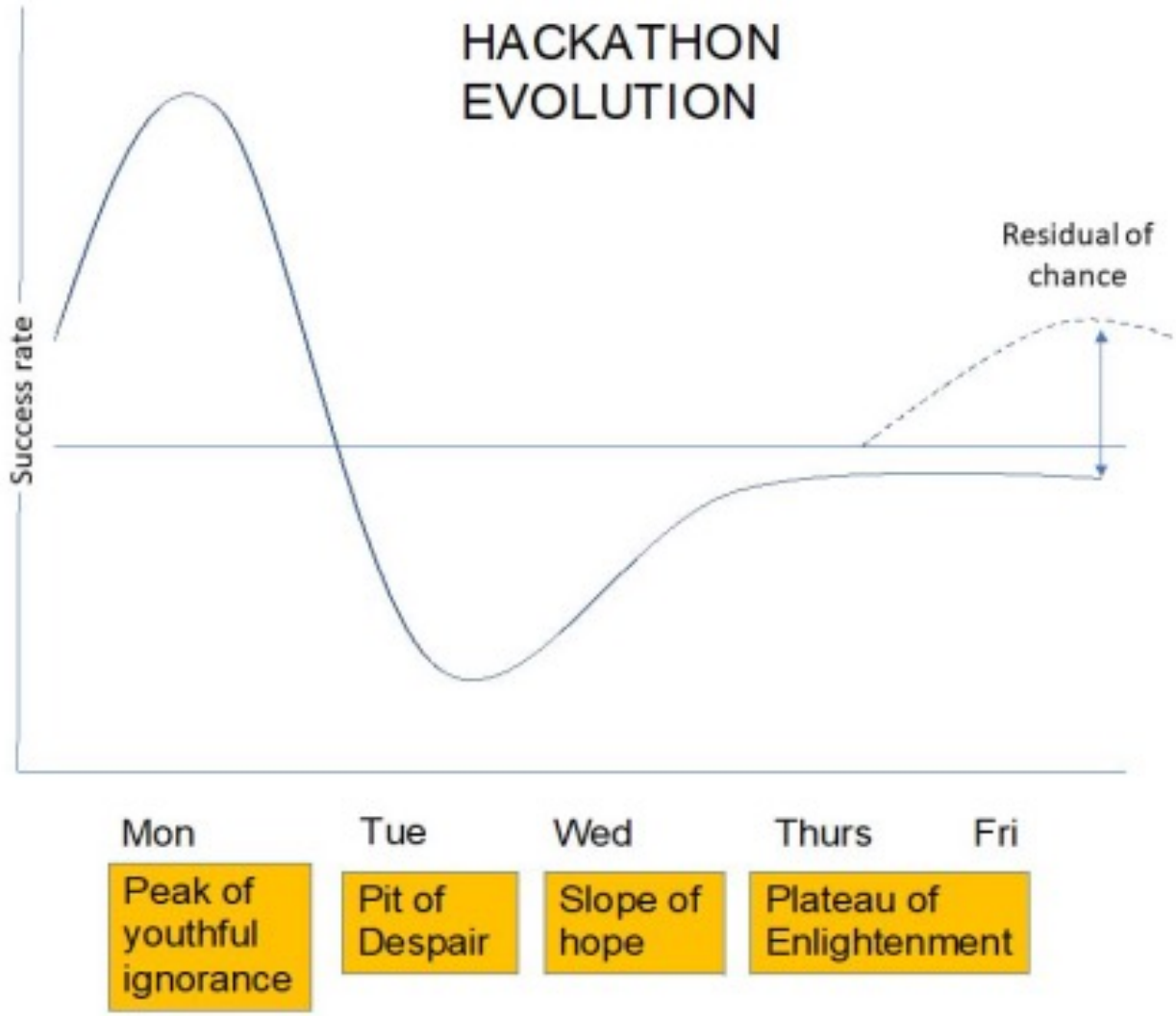
OPEN HACKATHONS
OpenACC


HACKATHON
EVOLUTION
Success rate
Residual of
chance
Mon
Tue
Wed
Thurs
Fri
Peak of
youthful
ignorance
Pit of
Despair
Slope of
hope
Plateau of
Enlightenment

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Total presentation time is 3 minutes

Team Name

Team Members (Name, organization, picture)

Mentors (Name, organization, picture)

Your app

Tell us about your application:

- What's the algorithmic motif?
- Libraries?
- Language?
- Which application module/function are you focusing on?
- GPU acceleration path (CUDA/OpenACC/OpenMP/TensorRT…)

Goals

- What would you like to achieve by the end of the week?

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OPEN HACKATHONS
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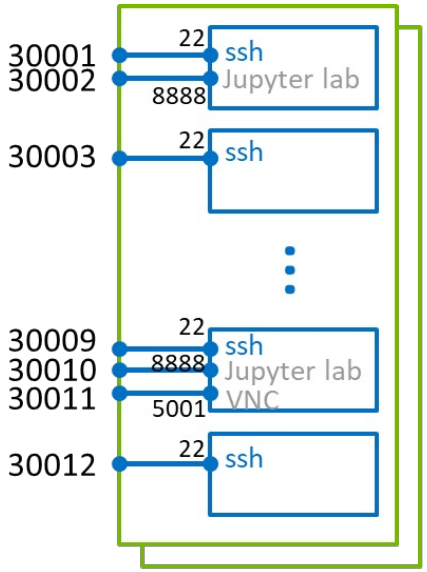
How to access your environment?

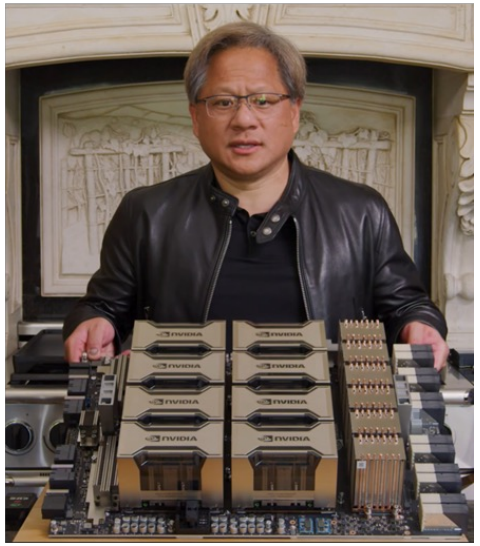
```
> ssh root@140.110.18.63 -P 30001

The authenticity of host '140.110.18.63
(140.110.18.63)' can't be established.
ECDSA key fingerprint is
SHA256:13t8Vtw7ckIEzuCvWXBcB9ZG0Y9HJJufwBC2j7xDwLU.
Are you sure you want to continue connecting
(yes/no/[fingerprint])? yes
Warning: Permanently added '140.110.18.63' (ECDSA) to
the list of known hosts.
root@140.110.18.63's password:
```

```
jupyter lab --allow-root \
--NotebookApp.token= 'YOUR_PASSWORD' \
--ip=0.0.0.0 --port=8888 --NotebookApp.allow_origin= '*' \
> jupyter.log 2>&1 &
```



140.110.18.**63**

140.110.18.**64**



DGX A100

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OPEN HACKATHONS
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Kick-off Meeting (Nov 16) Virtual	● 02:00PM - 02:05PM: Welcome and event overview (Jay, CK) ● 02:05PM – 02:10PM: NCHC opening (王順泰組長@NCHC) ● 02:10PM – 02:15PM: Hackathon team opening (Bharat) ● 02:15PM - 03:00PM: Round table self-introduction (Team & Mentor). ● 3 mins for each team lead ● 1 mins for two mentors per team ● 03:00PM - 03:05PM: 5 mins break ● 03:05PM - 03:15PM: Introduction to computing resources (Kuan-Ting) ● 03:15PM - 04:00PM: Introduction to Nsight Analysis Tools (Leo Chen) ● 04:00PM - 04:30PM: breakout rooms (Team & Mentor)
Day 1 (November 23) Virtual	● 02:00PM - 03:00PM: Scrum #1 (5 mins presentation per team)
Day 2 (November 30) Virtual	● 02:00PM - 03:00PM: Scrum #2 (5 mins presentation per team)
Day 3 (August 24) In-Person	● 10:00 AM - 10:30 PM: Welcome and event description ● 10:30 AM - 12:00 PM: Final presentation (12 mins presentation +3 minutes QA per team) ● 12:00 PM - 01:30 PM: Lunch time ● 01:30 PM - 03:00 PM: Final presentation (12 mins presentation +3 minutes QA per team) ● 03:00 PM - 04:00 PM: Wrap-up session

Gap Week(s)

- Gap week(s) are Slack-only days where mentors will provide light mentorship and respond to questions via slack when they are available. Mentor support during this time is asynchronous via slack only.
- Utilize this time to give teams assignments and make them better equipped to be successful at a hackathon.
- Gap week(s) between Day 0 to Day 1: help teams build the skills, compile and profile the code.
- Gap week(s) between Day 1 to Day 2 to Day 3: help teams stay on tasks, don't worry about immediate acceleration results.

Always ask for help right away

Organizers are here to help you and the team to be productive and happy!

Hackathon Preparation

1. Registration: Each team member and Mentor is required to register for the event. Please click **HERE** to register.
2. Learn **NVIDIA profiling tools** before coming to the event, and visit the "Tools" section on the **Technical Resources page**
3. Refresh or learn parallel programming concepts you plan to use at the event. Checkout https://www.openhackathons.org/s/technical-resources
4. Make sure that team members are fluent with the code and available for the duration of the event.
5. Help mentors to get familiar with the code to make sure that their time is spent efficiently at the event.
6. Discuss your team's goal(s) for the event and agreed on an initial strategy with Mentor(s).
7. Access compute cluster, install, compile and profile your code.

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Recorded Tutorials

For new users, we recommend to go through this list from top to bottom for an easier learning experience

- Basic Languages Tutorial given by Jeff Larkin/NVIDIA
- Math Library: cuSparse and cuSolver Overview by Samuel Rodriguez / Federico Busato
- Nsight Tutorial given by Max Katz/NVIDIA
- Nsight Compute + Nsight System Q&A + Demo by Chris Ashton / Jackson Marusarz / Tod Courtney
- Profiling with TensorFlow Demo, presented by Kaleb Smith/NVIDIA
- Pytorch Nsight System Demo given by Tod Courtney/NVIDIA

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SLACK: NCHC Open Hackathon

https://join.slack.com/t/nchcopenhackathon/shared_invite/zt-25plnuukn-s3kGINLiC1IUZwL47Xv8qQ

- **#cluster_ support**: Any questions on system, please submit in this channel
- **#announcement**: Please keep an eye on this channel for all important announcements, This channel is for Admin to post only. For any general questions, please submit under **#general** channel.
- **#profiler_support:** Please submit any questions you have on profiler here
- **#presentations**: Please make sure to post your presentation in PDF format
- Last but not least, don't forget to quickly introduce yourself under **#introduce-yourself** channel
- One channel per team **#team_<team name>**

***Your team channel is where you will be working closely with your Mentor(s) throughout the event.**

Live session will happen on MS Teams

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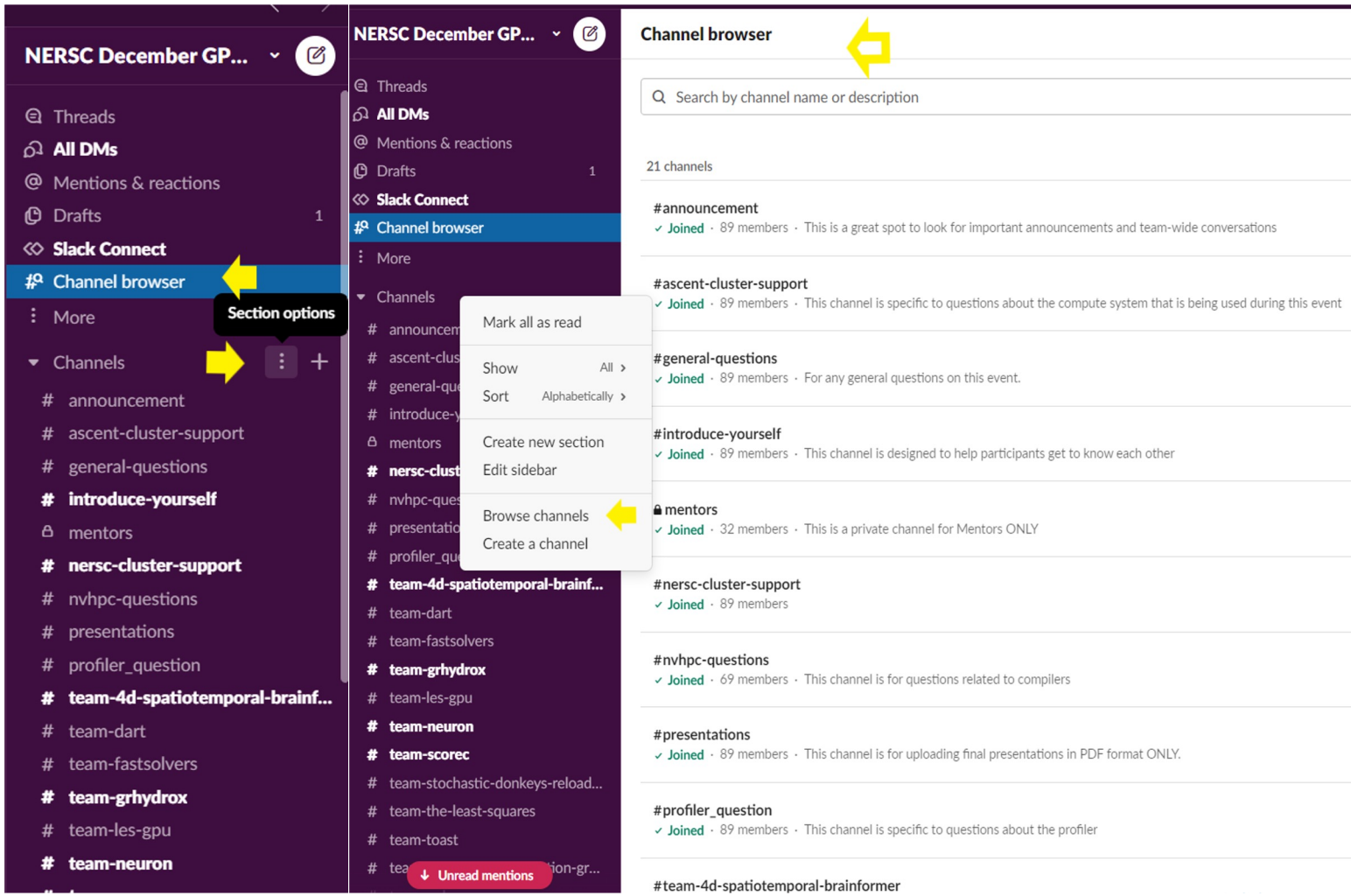
How to Find Different Slack Channels

Depends on your Slack settings. There are 2 ways to search all public channels.

Method 1: If you already have the **"Channel Browser"** function listed, go ahead and click on it to browse all public channels.

Method 2: If you don't see the "Channel Browser" function listed under your Slack, please follow the following steps to open it.

- Step 1: click on the 3 dots next to Channels
- Step 2: click on “Browse Channels”
- Step 3: “Channel Browser” will open. You will be able to locate all public channels.



When you meet with your Mentor(s), please make sure your team is prepared to:

1. Have a **working code** and **quick demo** to show your Mentors

2. **Have enough datasets to test on GPUs for this Hackathon** (Tips: Many of the applications brought to the Hackathon take hours/days to run. This is impractical given the short duration of the Hackathon. Therefore, a subset of the input data should be constructed to allow an execution of 10-15 minutes. This will allow team members to experiment with changes to improve performance and get results in short order. Don't forget, you can always use a larger input data for an 'overnight' run.)

3. **Do you have access to the cluster?** Please use the gap week before Day 1 to setup your environment and make sure every team members have access to the cluster.

4. Each team at the Hackathon must **have at least 3 individuals** and all individuals must participate for the entire Hackathon. Lack of participation for the duration of the Hackathon may cause the entire team to be excused.

5. **Each team member should be prepared to discuss their background**, with respect to GPUs/HPC/AI/etc, with their Mentor(s). If there is some knowledge a team member needs with respect to their background, please convey that to the Mentor(s) so that any deficiencies can be addressed as soon as possible.

6. Tell your Mentor(s) what would you like to achieve? What are your **goals**? Any help you might need?

7. Before **Day 1**, refresh or learn parallel programming concepts you plan to use at the event. Checkout https://www.openhackathons.org/s/technical-resources

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Breakout Rooms

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1	Schrödinger's cat	Reese Yun-Yuan	V	
2	haofan2023	Tian Frank Yun-Yuan		V
3	NTHU-LSALAB	Erez Ferber Sungta	V	
4	NTUST CFD Lab	Shijie Kuan-Ting	V	
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Meeting Links

https://docs.google.com/spreadsheets/d/16hEN61hwpwBXOJS_bqs2iD6hhTupSG9EZBBtAt5bWkU/edit?usp=sharing

SESSION	LINK
Presentations and common sessions	https://teams.microsoft.com/l/meetup-join/19:P304OKRcbi0vd9cWN3FY_T4m5bJdCEtpUSqnpie31ko1@thread.tacv2/1699503511807?context=%7B%22Tid%22:%2243083d15-7273-40c1-b7db-39efd9ccc17a%22,%22Oid%22:%222513987c-efde-4d24-b236-ed12abb5989a%22%7D
BREAKOUT ROOMS LINKS:	
Schrödinger's cat	https://teams.microsoft.com/l/meetup-join/19:7862b937120b4210b9d2d1d55076cc48@thread.tacv2/1699512196395?context=%7B%22Tid%22:%2243083d15-7273-40c1-b7db-39efd9ccc17a%22,%22Oid%22:%222513987c-efde-4d24-b236-ed12abb5989a%22%7D
haofan2023	https://teams.microsoft.com/l/meetup-join/19:89c0395201eb4263a9a88bd464f6e6cf@thread.tacv2/1699512231151?context=%7B%22Tid%22:%2243083d15-7273-40c1-b7db-39efd9ccc17a%22,%22Oid%22:%222513987c-efde-4d24-b236-ed12abb5989a%22%7D
NTHU-LSALAB	https://teams.microsoft.com/l/meetup-join/19:6195047a935d474a92218eb2b342cc74@thread.tacv2/1699512258954?context=%7B%22Tid%22:%2243083d15-7273-40c1-b7db-39efd9ccc17a%22,%22Oid%22:%222513987c-efde-4d24-b236-ed12abb5989a%22%7D
NTUST CFD Lab	https://teams.microsoft.com/l/meetup-join/19:68f3ebbdf04543f6b54c00bf898b4330@thread.tacv2/1699512291643?context=%7B%22Tid%22:%2243083d15-7273-40c1-b7db-39efd9ccc17a%22,%22Oid%22:%222513987c-efde-4d24-b236-ed12abb5989a%22%7D
CWA-mesh gen for MPAS model	https://teams.microsoft.com/l/meetup-join/19:2a0599d8863d4cb7bfdb0dad3a7b3a4c@thread.tacv2/1699512326478?context=%7B%22Tid%22:%2243083d15-7273-40c1-b7db-39efd9ccc17a%22,%22Oid%22:%222513987c-efde-4d24-b236-ed12abb5989a%22%7D
CYCU BME	https://teams.microsoft.com/l/meetup-join/19:a12e6d8ebee84e36be3cdecde4c7a203@thread.tacv2/1699512437143?context=%7B%22Tid%22:%2243083d15-7273-40c1-b7db-39efd9ccc17a%22,%22Oid%22:%222513987c-efde-4d24-b236-ed12abb5989a%22%7D
CWA_GVER	https://teams.microsoft.com/l/meetup-join/19:08d66b171ded4c089a130868172d9169@thread.tacv2/1699512468007?context=%7B%22Tid%22:%2243083d15-7273-40c1-b7db-39efd9ccc17a%22,%22Oid%22:%222513987c-efde-4d24-b236-ed12abb5989a%22%7D
WTMH	https://teams.microsoft.com/l/meetup-join/19:d1763a7e8cf24e4e82cb9bc64be06178@thread.tacv2/1699512493995?context=%7B%22Tid%22:%2243083d15-7273-40c1-b7db-39efd9ccc17a%22,%22Oid%22:%222513987c-efde-4d24-b236-ed12abb5989a%22%7D
氣象署-興大應數聯隊 (氣興聯隊)	https://teams.microsoft.com/l/meetup-join/19:d7bad03a99fb4d83a22cf11bdf9b90fb@thread.tacv2/1699512518169?context=%7B%22Tid%22:%2243083d15-7273-40c1-b7db-39efd9ccc17a%22,%22Oid%22:%222513987c-efde-4d24-b236-ed12abb5989a%22%7D
YSS	https://teams.microsoft.com/l/meetup-join/19:a8f15bf38fbe417faf55b89dd1640670@thread.tacv2/1699512557141?context=%7B%22Tid%22:%2243083d15-7273-40c1-b7db-39efd9ccc17a%22,%22Oid%22:%222513987c-efde-4d24-b236-ed12abb5989a%22%7D
TXM_AI_group	https://teams.microsoft.com/l/meetup-join/19:b9c2c23763c74f70aee30fb8d2ed749f@thread.tacv2/1699512581236?context=%7B%22Tid%22:%2243083d15-7273-40c1-b7db-39efd9ccc17a%22,%22Oid%22:%222513987c-efde-4d24-b236-ed12abb5989a%22%7D
NCHC Speedrunning team	https://teams.microsoft.com/l/meetup-join/19:12b3ac2a395e401c82ab54bd22733e42@thread.tacv2/1699512605289?context=%7B%22Tid%22:%2243083d15-7273-40c1-b7db-39efd9ccc17a%22,%22Oid%22:%222513987c-efde-4d24-b236-ed12abb5989a%22%7D

Day 1,2

NARLabs 國家實驗研究院
國家高速網路與計算中心
National Center for High-performance Computing

Kick-off Meeting (Nov 16) Virtual	● 02:00PM - 02:05PM: Welcome and event overview (Jay, CK) ● 02:05PM – 02:10PM: NCHC opening (王順泰組長@NCHC) ● 02:10PM – 02:15PM: Hackathon team opening (Bharat) ● 02:15PM - 03:00PM: Round table self-introduction (Team & Mentor). ● 3 mins for each team lead ● 1 mins for two mentors per team ● 03:00PM - 03:05PM: 5 mins break ● 03:05PM - 03:15PM: Introduction to computing resources (Kuan-Ting) ● 03:15PM - 04:00PM: Introduction to Nsight Analysis Tools (Leo Chen) ● 04:00PM - 04:30PM: breakout rooms (Team & Mentor)
Day 1 (November 23) Virtual	● 02:00PM - 03:00PM: Scrum #1 (5 mins presentation per team)
Day 2 (November 30) Virtual	● 02:00PM - 03:00PM: Scrum #2 (5 mins presentation per team)
Day 3 (August 24) In-Person	● 10:00 AM - 10:30 PM: Welcome and event description ● 10:30 AM - 12:00 PM: Final presentation (12 mins presentation +3 minutes QA per team) ● 12:00 PM - 01:30 PM: Lunch time ● 01:30 PM - 03:00 PM: Final presentation (12 mins presentation +3 minutes QA per team) ● 03:00 PM - 04:00 PM: Wrap-up session

Total presentation time is 4 minutes

Team Name

Team Members (Name and organization)

Mentors (Name and organization)

Profiler Output

Progress and Goals

- What have you accomplished since yesterday?
- What are your goals for the day?

Problems and Solutions

- What problems are you currently facing?
- Have you resolved any problems (or found bugs) that others might find useful?

Day 3 – Final Presentation

NARLabs 國家實驗研究院
國家高速網路與計算中心
National Center for High-performance Computing

Kick-off Meeting (Nov 16) Virtual	● 02:00PM - 02:05PM: Welcome and event overview (Jay, CK) ● 02:05PM – 02:10PM: NCHC opening (王順泰組長@NCHC) ● 02:10PM – 02:15PM: Hackathon team opening (Bharat) ● 02:15PM - 03:00PM: Round table self-introduction (Team & Mentor). ● 3 mins for each team lead ● 1 mins for two mentors per team ● 03:00PM - 03:05PM: 5 mins break ● 03:05PM - 03:15PM: Introduction to computing resources (Kuan-Ting) ● 03:15PM - 04:00PM: Introduction to Nsight Analysis Tools (Leo Chen) ● 04:00PM - 04:30PM: breakout rooms (Team & Mentor)
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Total presentation time is 12 minutes + 3 minutes QA

Team Name

Team Members (Name and organization)

Mentors (Name and organization)

App Name

- Problem trying to solve
- Scientific driver for the chosen algorithm
- What's the algorithmic motif?
- What parts are you focusing on?

Evolution and Strategy

- What was your goal coming here?
- What was your initial strategy?
- How did this strategy change?

Results and Final Profile

- What were you able to accomplish?
  - Did you achieve speed up?

    (*show multi-core CPU vs GPU numbers)

- What did you learn?
  - Create a new algorithm?
  - Achieved new scientific goals?

Energy Efficiency

The calculator will compare energy consumption of a number of CPU only nodes with dual CPUs required to perform the same amount of work as 1 GPU node with 2 CPUs and 8 GPUs.

INPUTS	
# CPU Cores	64
# GPUs (A100)	6
Application Speedup	20.0x

Node Replacement	13.3x

GPU NODE POWER SAVINGS			
	AMD Dual Rome 7742	8x A100 80GB SXM4	Power Savings
Compute Power (W)	14,667	6,500	8,167
Networking Power (W)	619	93	526
Total Power (W)	**15,286**	**6,593**	8,693

Node Power efficiency	**2.3x**

ANNUAL ENERGY SAVINGS PER GPU NODE			
	AMD Dual Rome 7742	8x A100 80GB SXM4	Power Savings
Compute Power (kWh/year)	128,480	56,940	71,540
Networking Power (kWh/year)	5,424	814	4,610
Total Power (kWh/year)	**133,904**	**57,754**	**76,150**

$/kWh	$	0.18
Annual Cost Savings	$	13,707.04
3-year Cost Savings	$	41,121.13

Metric Tons of CO2	54
Gasoline Cars Driven for 1 year	12
Seedlings Trees grown for 10 years	892

(source: Link)

1. Use this calculator for your report
2. Add your acceleration numbers in the INPUTS section
3. Modify $/kwh number if necessary
4. Paste a screenshot similar to the one on the right in this slide to report energy efficiency of your project

What problems have you encountered?

- Problems with legacy app structure
- Issues with algorithm
- Tool bugs
- Tool lack of features
- System setup

Wishlist

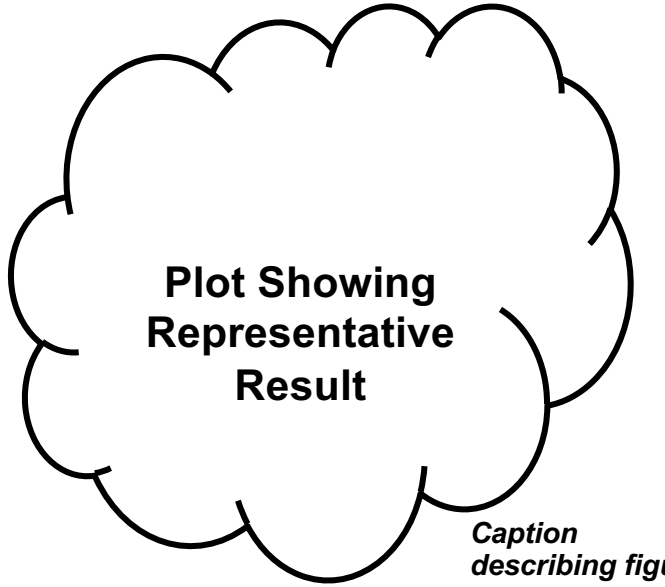
- What do you wish existed to make your life easier?
  - Tools
  - Language standards
  - Event
  - Systems

Was it worth it?

- Was this worth it?
- Will you continue development?
  - Next steps, future plans
- What sustained resources/support will be critical for your work after the event?

Application Background

- High-level description of application and uses
- Light on domain-specific jargon; should be appropriate for general technical audience
- Computational motifs targeted at hackathon



Caption describing figure in simple terms

Hackathon Objectives and Approach

- Programming models
- Profiling / hot spots
- Refactorings
- Libraries
- Performance tuning
- Other

Technical Accomplishments and Impact

- What were you able to achieve at the hackathon?
- How did you achieve it?
- Speedup
- Why does it matter / what does it enable?

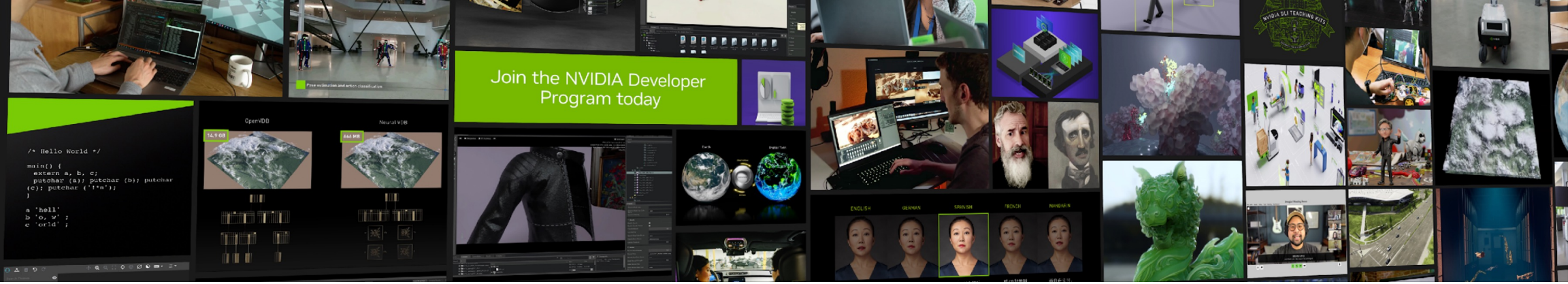
Please use 100 words to summarize your team’s achievements during this Hackathon

PROMOTING YOUR WORK: AVAILABLE OPPORTUNITIES

- **Papers and Talks:** Please acknowledge the Open Hackathons program and OpenACC Organization in any planned or upcoming papers, presentations, or talks.

  "This work was completed in part at the [Event name], part of the Open Hackathons program. The authors would like to acknowledge OpenACC-Standard.org for their support."
- **Social Media Support:** Please feel free to promote your participation across your social media channels. Tag **@OpenACCorg** and **#OpenHackathons** and we are happy to amplify.
- **Blogs and Technical Write-ups**: Create a blog post or technical article that highlights the work being done and results achieved.
- **Quotes and Testimonials:** Highlight your quote or feedback on our channels (i.e. social, website, etc.).

***Please reach out to
Jinny Lin (jinnyl@nvidia.com) and Jay Chen (jaych@nvidia.com)
to discuss marketing options and opportunities.**



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- Timeline: Present ~ Jan 2024.

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More Science, Less Programming