



AIWARE BOOTCAMP

TORONTO,
CANADA



How to cite this session?

```
@misc{Hassan2024AIwareOpening,  
author = {Ahmed E. Hassan and Gopi Krishnan Rajbahadur and Zhen Ming Jiang and Dayi Lin and  
Bram Adams and Ying Zhou},  
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```



Check this paper for more information about this session

```
@inproceedings{Hassan2024FSE,  
author = {Hassan, Ahmed E. and Lin, Dayi and Rajbahadur, Gopi Krishnan and Gallaba, Keheliya and Cogo, Filipe Roseiro and Chen, Boyuan and Zhang, Haoxiang and Thangarajah, Kishanthan and Oliva, Gustavo and Lin, Jiahuei (Justina) and Abdullah, Wali Mohammad and Jiang, Zhen Ming (Jack)},  
title = {Rethinking Software Engineering in the Era of Foundation Models: A Curated Catalogue of Challenges in the Development of Trustworthy FMware},  
year = {2024},  
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address = {New York, NY, USA},  
url = {https://doi.org/10.1145/3663529.3663849},  
booktitle = {Companion Proceedings of the 32nd ACM International Conference on the Foundations of Software Engineering},  
pages = {294-305},  
numpages = {12},  
series = {FSE 2024}  
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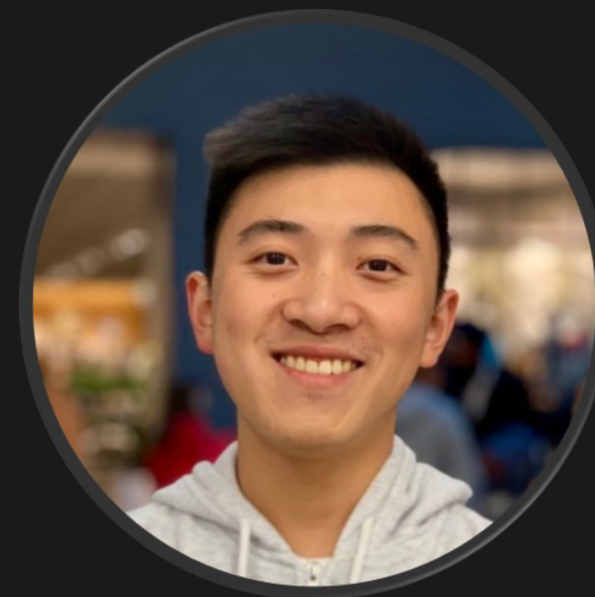
**AIWARE
BOOTCAMP**

Ahmed E. Hassan
Queen's University

Gopi Krishnan Rajbahadur
Centre For Software
Excellence, Huawei Canada

Jack Jiang
York University

Welcome!



Dayi Lin
Centre For Software
Excellence, Huawei Canada

Bram Adams
Queen's University

Ying Zou
Queen's University



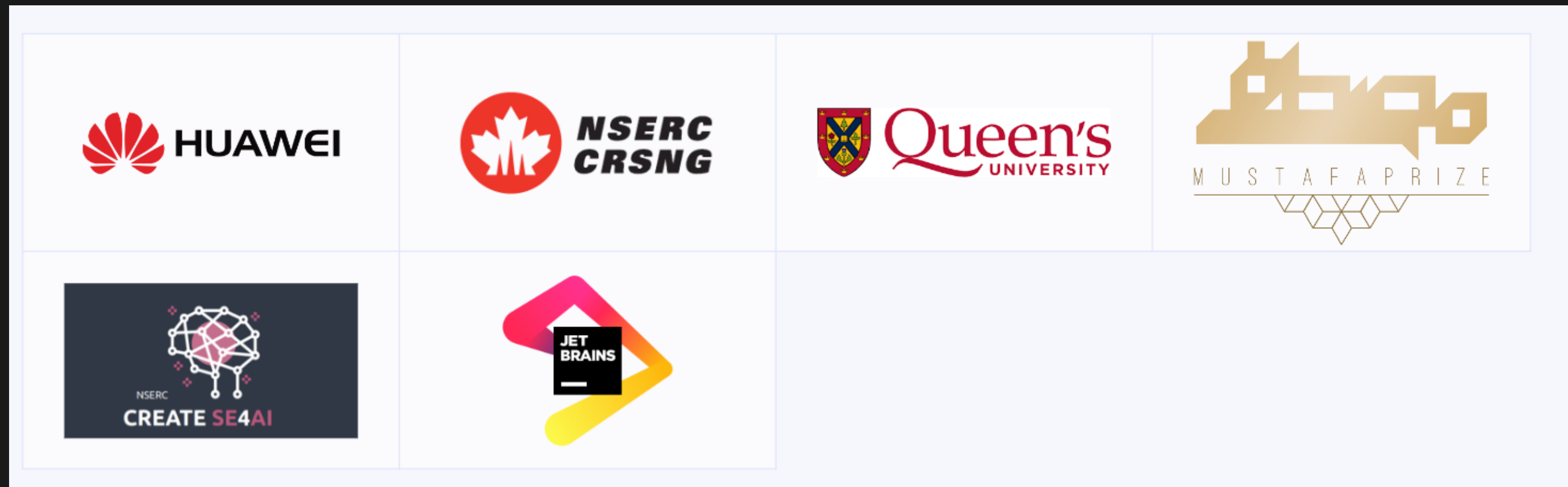
Thanks to our Amazing Curriculum Committee!



- Bram Adams, Queen's University, Canada
- Eddie Aftandilian, GitHub, USA
- Boyuan Chen, Centre for Software Excellence, Huawei, Canada
- Satish Chandra, Google, USA
- Filipe R. Cogo, Centre for Software Excellence, Huawei, Canada
- Prem Devanbu, University of California Davis, USA
- Danny Dig, University of Colorado Boulder and JetBrains Research, USA
- Ke Ding, Intel, USA
- Keheliya Gallaba, Centre for Software Excellence, Huawei, Canada
- Ahmed E. Hassan, Queen's University, Canada
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- Yoshimura Kentaro, Hitachi, Japan
- Foutse Khomh, Polytechnique Montréal, Canada
- Jiahuei (Justina) Lin, Centre for Software Excellence, Huawei, Canada
- Dayi Lin, Centre for Software Excellence, Huawei, Canada
- Yiling Lou, Fudan University, China
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- Orlando Marquez, Servicenow, USA
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- Gopi Krishnan Rajbahadur, Centre for Software Excellence, Huawei, Canada
- Baishakhi Ray, Columbia University, AWS, USA
- Ben Rombaut, Centre for Software Excellence, Huawei, Canada
- Tom Zimmermann, Microsoft, USA
- Haoxiang Zhang, Centre for Software Excellence, Huawei, Canada
- Lingming Zhang, University of Illinois Urbana-Champaign, USA



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A Special Thanks!



Alware – Software for all by all!



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Yoshua Bengio

“I must humbly admit that it was only this year, as I studied OpenAI’s large language model (LLM) ChatGPT and projected myself into the future, that I realized ...”

Oct 2023

*“**Generative models suck!....** LLMs have limited knowledge of the underlying reality ... Machines will eventually surpass human intelligence in all domains”*



Yann LeCun

Oct 2023



Sal Khan

*“we must **fight like hell for the positive use case** .. AI can enhance HI (Human Intelligence)”*

May 2023



Alware – Software for all by all!



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*...these workloads...just so different and new. I have been in this infrastructure business for three decades....just really the **shape of Azure is drastically changed and is changing rapidly** to support of these models that you are building.”*

Nov 2023



Satya
Nadella



Bill
Gates

*AI is about to **completely** change how you use computers (and **upend the software industry**).*

Nov 2023



“open innovation” in the FM Era



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...we have to continuously learn and adapt by *deploying less powerful versions* of the technology in order to minimize “one shot to get it right” scenarios ...
will require much more caution than society usually applies to new technologies, and more caution than many users would like.

Feb 2023

SE+AI: Enabling the future of humanity



Sam Altman



Three perspectives on SE and FMs



3+1 perspectives that involve SE and FMs

- FM for SE (FM4SE/AI4SE – Intelligent SE 2.0)
- SE for FM/AI-powered Software (SE4FMware/SE4AIware)
- SE for FM (SE4FM)
 - SE for NN operators

Not necessarily or easily separable as they overlap



Alware: Rethinking Software!



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Alware

FMware

Software 1.0 Codeware

- Traditional Programming
- Logic-driven
- Developed by Software Developers

Software 2.0 Neuralware

- AI (data + model structure) Programming
- Neural-driven
- Developed by AI experts

Software 3.0 Promptware

- Prompt Programming
- Generative FM-driven
- Developed by domain and prompt experts (assisted with AI)

Software 4.0 Agentware

- Trusted SW Agents (Single/Multi)
- Reasoning with continuous self-improvement based on experience/values/environment
- Co-led by human+agents.
- Human in & on Loop
- Trustworthiness at the core not a Band-Aid

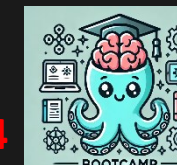
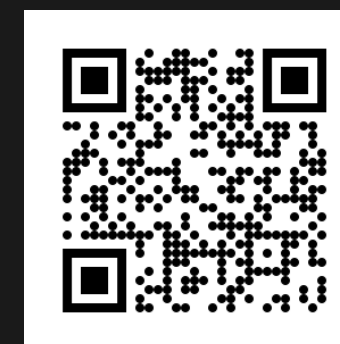
Software 5.0 Mindware

- Intelligent Programming
- AGI era has arrived, World model-driven
- Led by autonomous agents
- Humans intervene less instead define constitutions
- Human on Loop

Software
Before AI

Software
After AI

*We are
mostly
here now!*





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**Foundation Models/LLMs
Change everything!**

**We must rethink Software, Software
Engineering, SE Innovation**



AlwareConf.org

Software for all by all!



“open innovation” in the FM Era



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BigCode

Supported by

servicenow



Hugging Face



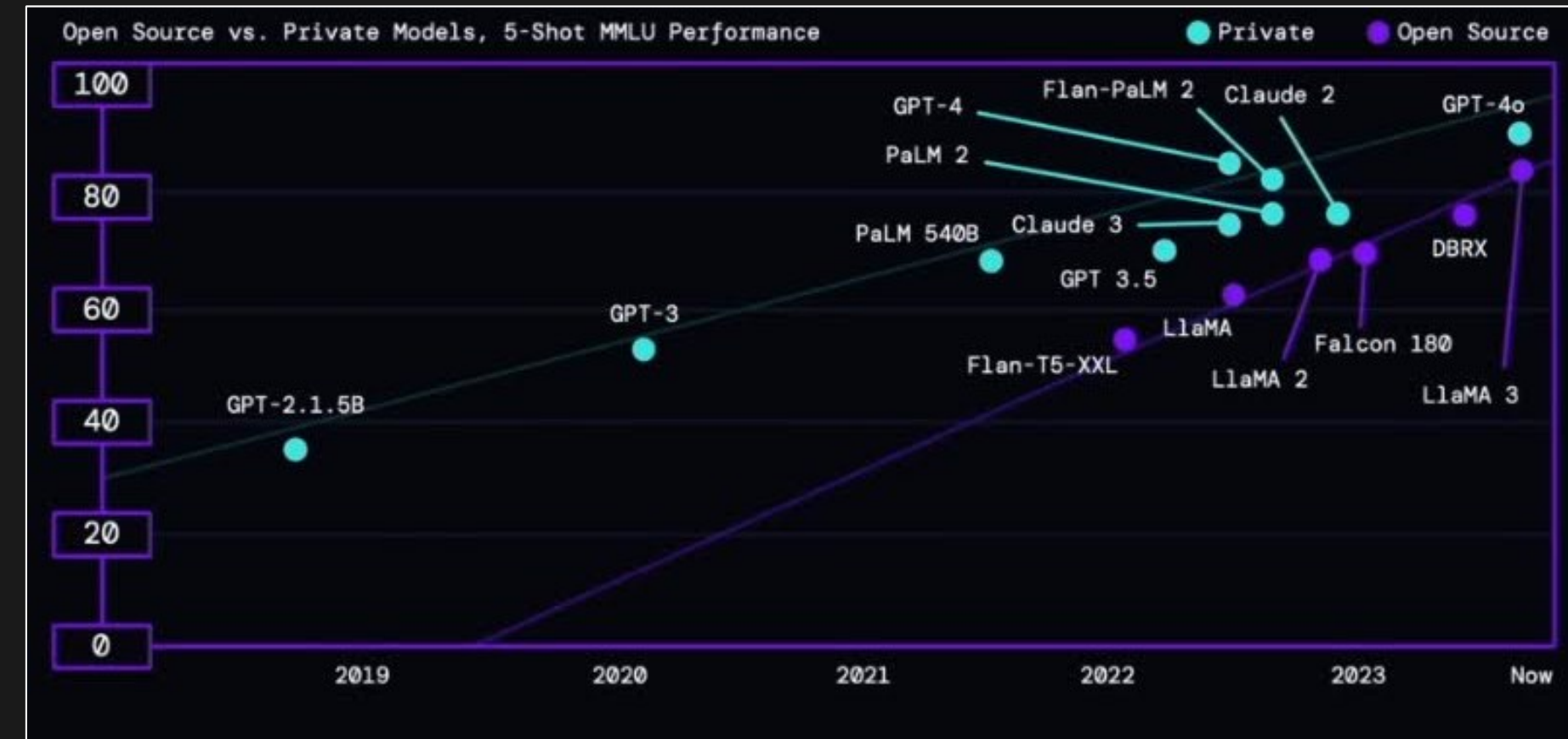
They produce state of the art code FMs that outperforms larger open access code FMs

🔗 StarCoder 2 and The Stack v2: The Next Generation

Anton Lozhkov¹ Raymond Li² Loubna Ben Allal¹ Federico Cassano⁴ Joel Lamy-Poirier²
 Nouamane Tazi¹ Ao Tang³ Dmytro Pykhtar³ Jiawei Liu⁷ Yuxiang Wei⁷ Tianyang Liu²⁵
 Max Tian² Denis Kocetkov² Arthur Zucker¹ Younes Belkada¹ Zijian Wang⁵ Qian Liu¹²
 Dmitry Abulkhanov⁵ Indraneil Paul³² Zhuang Li¹⁴ Wen-Ding Li²⁰ Megan Risdal²⁴ Jia
 Li³ Jian Zhu¹⁶ Terry Yue Zhuo^{14,15} Evgenii Zheltonozhskii¹³ Nii Osae Osae Dade²⁸
 Wenhao Yu²⁰ Lucas Krauß⁷ Naman Jain²⁷ Yixuan Su²⁰ Xuanli He²³ Manan Dey³¹
 Edoardo Abati⁵ Yekun Chai³³ Niklas Muennighoff²⁹ Xiangru Tang³⁴ Muhtasham
 Oblokulov¹⁸ Christopher Akiki^{9,10} Marc Marone⁸ Chenghao Mou⁵ Mayank Mishra¹⁹
 Alex Gu¹⁷ Binyuan Hui⁵ Tri Dao²¹ Armel Zebaze¹ Olivier Dehaene¹ Nicolas Patry¹
 Canwen Xu²⁵ Julian McAuley²⁵ Han Hu¹⁴ Torsten Scholak² Sebastien Paquet² Jennifer
 Robinson⁶ Carolyn Jane Anderson²² Nicolas Chapados² Mostofa Patwary³ Nima
 Tajbakhsh³ Yacine Jernite¹ Carlos Muñoz Ferrandis¹ Lingming Zhang⁷ Sean Hughes⁶
 Thomas Wolf¹ Arjun Guha^{4,11} Leandro von Werra^{1,*} Harm de Vries^{2,*}

StarCoder 2 15B matches or outperforms the performance of codeLlama-34B

The training process, code and all the datasets used to create such models are openly available



**We use the term
Foundation Models
Instead of LLMs**

***It does NOT
make sense to order a
Small Large Latte Mocha***



Two Dinners



Sunday 7:45PM
Sushi AYCE

Tuesday 5:45PM
Indian



Daily lunches and breaks will all be outside of our room



Thursday Excursion

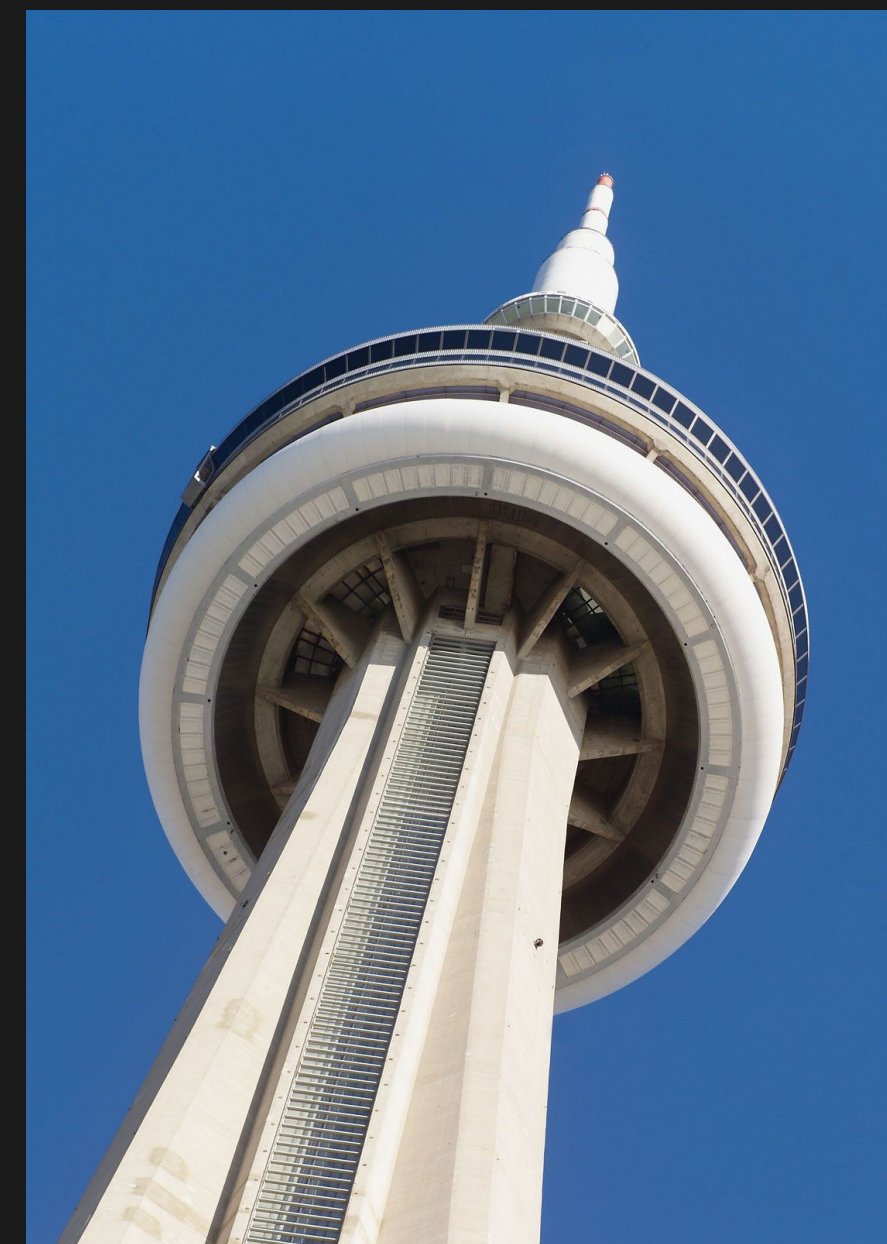
12:45PM meet at aquarium entrance



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12:45PM-3:00PM

3:15PM – 6:00PM



Thursday Excursion

12:45PM meet at aquarium entrance



Internet Access



Please Use eduroam or the Guest Network



Online Communication



Please check your email for the link to join the Slack group



SPEAK UP



Please participate and ask questions, we will be going through lots of material

