A New Horizon: Space Apps in Canada

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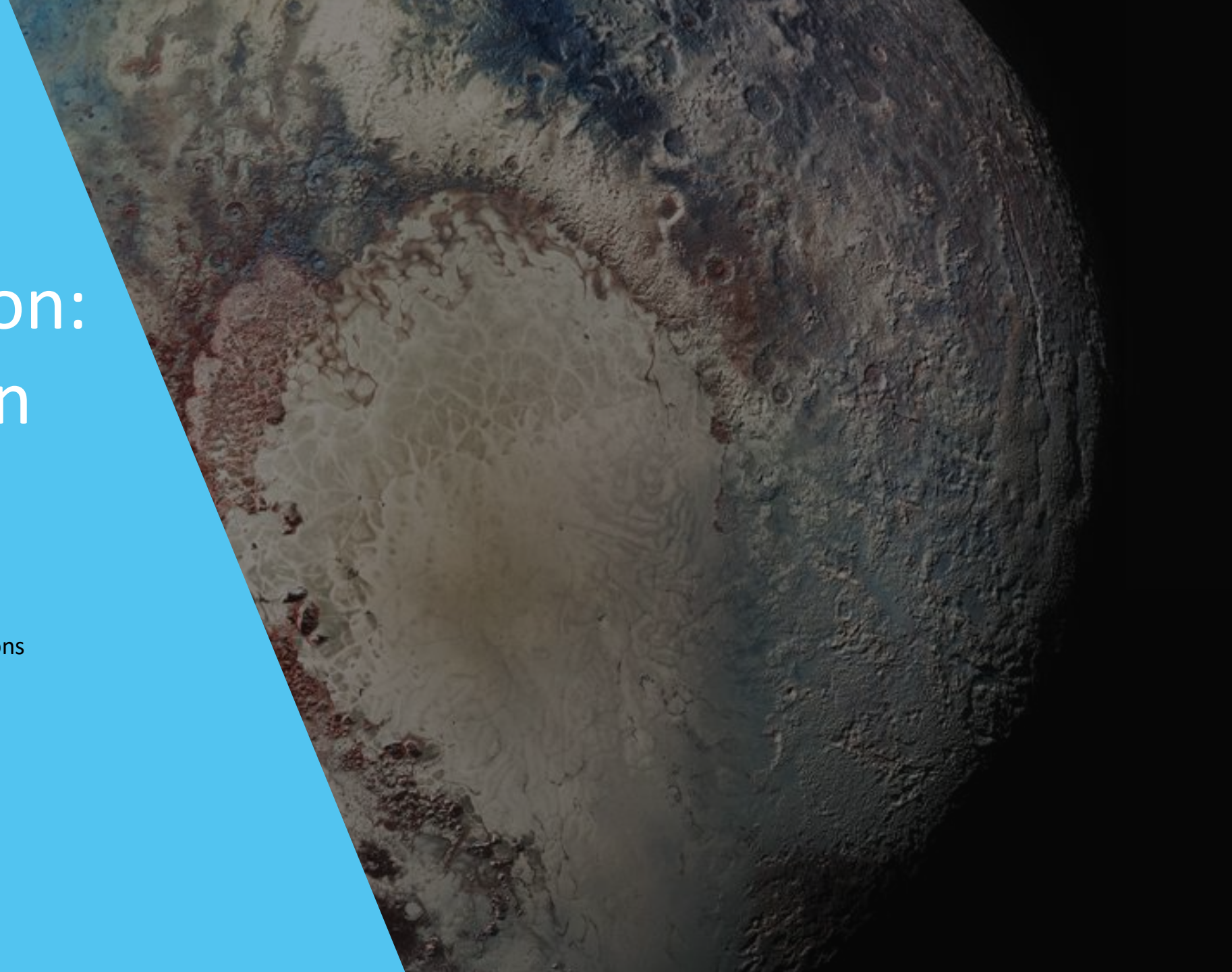
DEPLOY
SOLUTIONS



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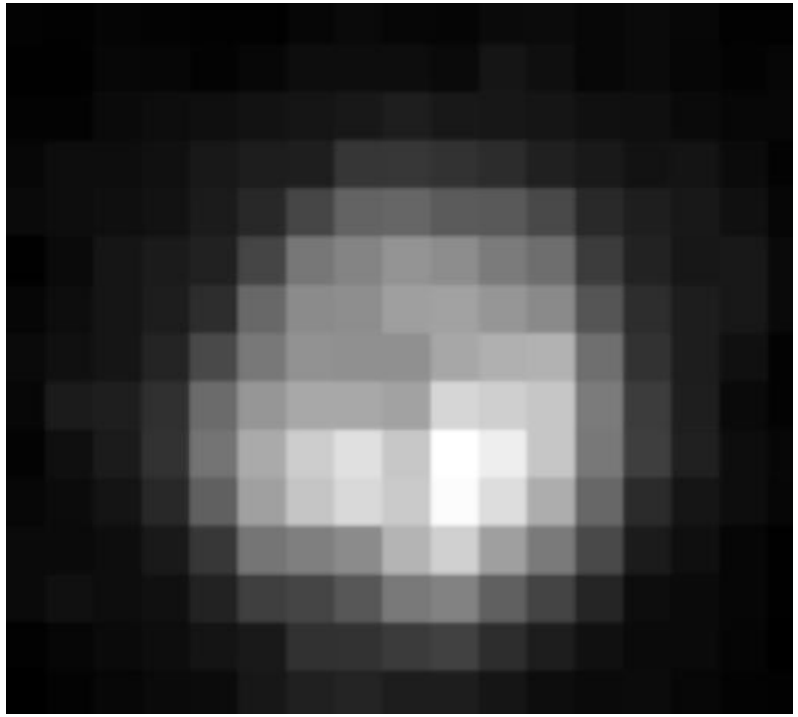
New Horizons Mission to Pluto

Began in 2006…



After flyby in 2015…

HACKS & HACKATHONS

Hacking and Hackathons

People love to “hack” and will do it in their spare time for free!

How a hackathon generally works:

- Time-limited, usually in a single physical location
- Challenges posed by organizers, sponsors, or participants
- Participants form teams to tackle challenges and “hack” solutions
- Solutions are open source

Hackathon Benefits

- Why get involved as a participant?
  - Chance to learn about and help solve real challenges
  - Personal development
  - Professional networking opportunities
  - Fun and enjoyment!
- Why get involved as a sponsor?
  - Brand awareness and outreach
  - Hiring opportunities – interns and full-time employees with STEM skills
  - Tools and product usage and development, real-time feedback

THE NASA INTERNATIONAL SPACE APPS HACKATHON

NASA International Space Apps Hackathon

- Began in 2012 – now the world's largest hackathon
- Goals:
  - Exemplifies principles of transparency, participation and collaboration
  - Utilizes openly available data, supplied through NASA missions and technology
  - Utilizes the talent and skill of passionate volunteers from around the planet
  - Advances space exploration and improve the quality of life on Earth
- www.spaceappschallenge.org

How It Works

- NASA posts challenges it wants solved & picks a weekend for the hackathon
- Volunteer organizers host the event in their cities
- Participants attend virtually or physically
- They pick a challenge, form teams, and use open data sets to solve the challenges
- On Sunday they present to their local judges and 2 winning teams are selected for a further round
- NASA then judges all the winning presentations and picks the global winners

Solution Types

Solutions are usually software or digital:

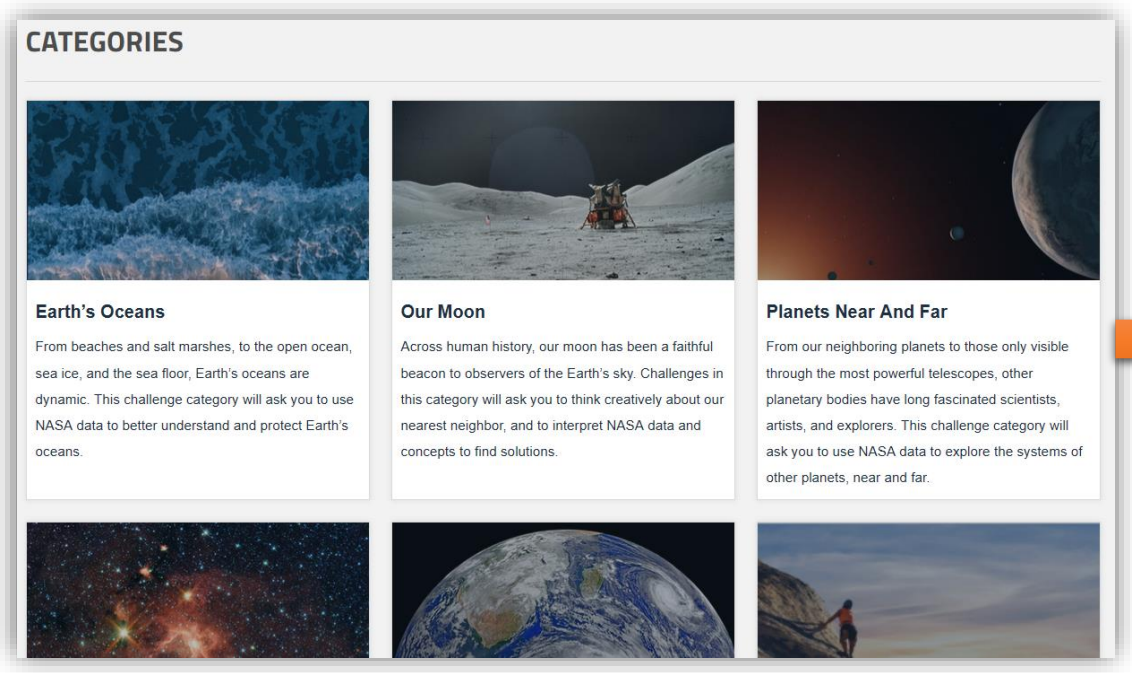
- Websites
- Videos
- Virtual Reality and Games
- Mobile Apps
- Machine Learning Algorithms and data sets

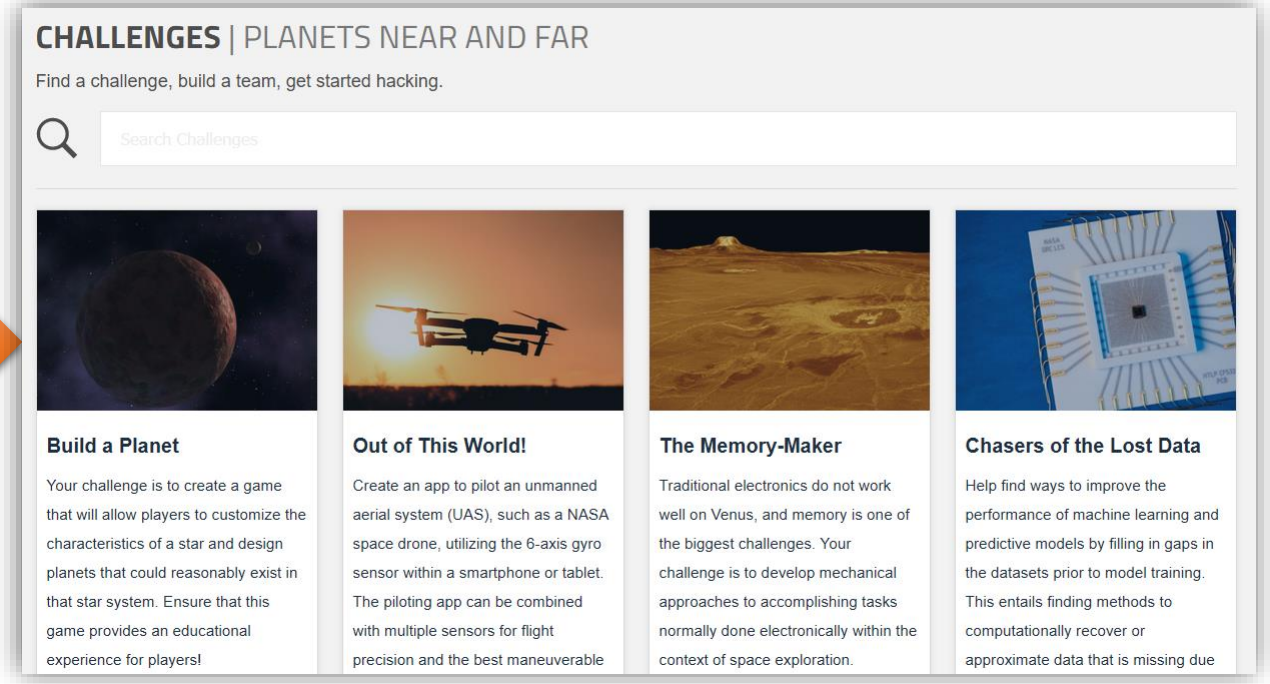
But they can be hardware or physical too…

NASA Hackathon Statistics

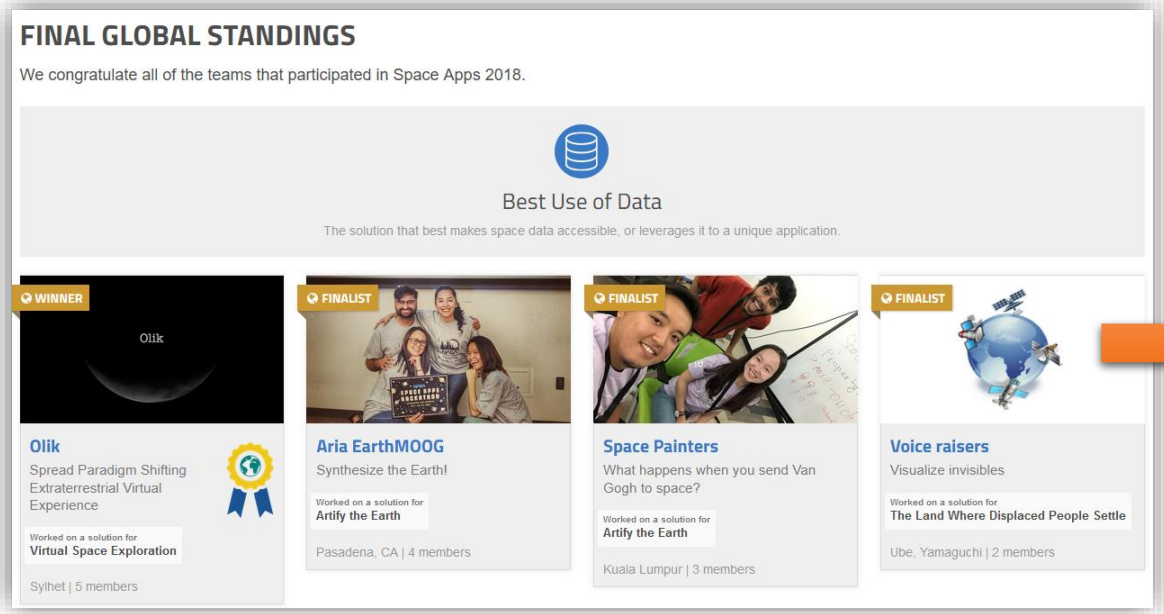
Year	Participants	Locations	Countries
2012	2,000	25	17
…	…	…	…
2018	25,000	187	69
2019	29,000 (+1350%)	230 (+820%)	80 (+370%)

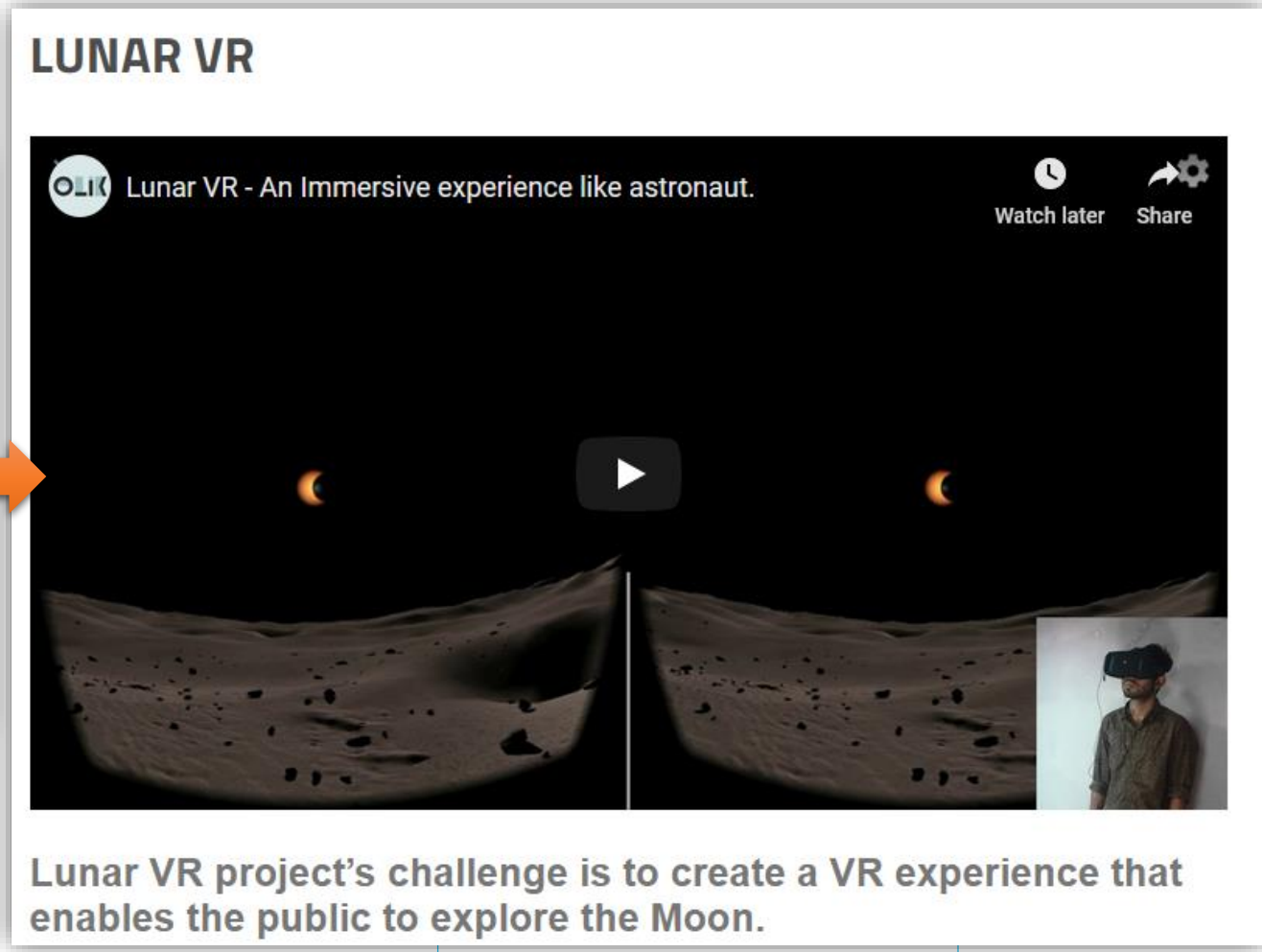
Examples of NASA Challenges





2018 Global Winners





2018 Global Winner Example – Best Use of Data: Team Olik

"Only 12 astronauts have walked on the moon in the history of mankind. So it is quite rare to be this close to the moon. In Lunar VR we tried to give the user an opportunity to explore the moon and marvel at its beauty."

Video: Team Olik. https://youtu.be/25xkBeYIMC0
More information on the project: https://2018.spaceappschallenge.org/challenges/universe-beauty-and-wonder/virtual-space-exploration/teams/olik/project

- Resources used:
  - 3D model of Lunar Module (https://nasa3d.arc.nasa.gov/detail/lunarlandernofo...)
  - 3D model of Apollo 11 Landing site (https://nasa3d.arc.nasa.gov/detail/Apollo11-Landin...)
  - Texture map of Moon (https://moontrek.jpl.nasa.gov/)
  - LRO Diviner Surface Temperature Mosaic (https://trek.nasa.gov/moon/TrekWS/rest/cat/data/st...)
  - Bootprint texture of first man on the moon (https://nasa3d.arc.nasa.gov/detail/as11-40-5878)
  - Apollo 11 mission information (https://www.nasa.gov/mission_pages/apollo/missions...)
  - LRO 3D model (https://nasa3d.arc.nasa.gov/detail/jpl-vtad-lro)
- Tools used:
  - Unity 3D
  - Blender
  - C# programming language
  - Adobe Photoshop
  - Google Cardboard SDK
  - TTS service used from Neospeech (www.neospeech.com)

CANADA'S HISTORY IN SPACE APPS

Space Apps in Canada

- Initially the events were simply the local versions of the NASA event
- Early history is quite hard to pin down
- Beginning in 2017, Canadian federal government began to support the event

Space Apps in Canada Statistics

Year	Locations	Total Participants	Participants on CSA challenges
2012	Vancouver, Montreal	?	-
2013	Toronto	?	-
2014	Toronto, Kitchener-Waterloo	?	-
2015	Toronto	?	-
2016	Toronto, Kitchener-Waterloo	?	-
2017	Toronto, Kitchener-Waterloo, Ottawa	200	30
2018	Edmonton, Winnipeg, Kitchener-Waterloo, Toronto, Ottawa, Montreal	425	56
2019	Halifax, Calgary, Edmonton, Kitchener-Waterloo, Ottawa, Montreal, Toronto	600	173

SkyWatch

- Skywatch team won global event in 2014 solving an astrophysics challenge
- The team started building Skywatch shortly after
- The only company created in history of event?
- CEO James Slifierz remembers how fascinating it was to show up at the event and learn about space - began to understand geospatial EO.
- Space Apps doesn’t outright encourage creation of a business. It’s a gateway into space industry and exposure to cool things. Wouldn’t have known about space industry needs otherwise.

Space Apps Ottawa

- Began in 2017 by myself, Ryan Anderson, Arthur Ruff with help from Space Apps Toronto and Waterloo. Now we have 10 regular organizers & volunteers.
- Hosted and strongly supported by Dr. Steven Muegge and Carleton University's Technology Innovation Management (TIM) program.
- 65 participants this year, many university students or recent graduates
- Our goals include gender parity and increasing engagement from youth and traditionally under-represented groups
- Recent rebranding to emphasize dual nature of event (NASA + CSA)
- www.spaceappsottawa.com

Examples of CSA Challenges

Challenge 4: Radi-N2 Interactive Map: Graphical Representation of Radiation Across Canada

Make the most of David Saint-Jacques', Chris Hadfield's and Robert Thirsk's missions to help Canadians visualize or interpret radiation data collected on the ISS and on Earth.

Challenge 1: STRATOS

The CSA uses stratospheric balloons to test and validate new technologies designed for long-duration space missions and to conduct scientific experiments in a space-like environment. The CSA captures in-flight images and compiles telemetry data (altitude, speed, atmospheric pressure, temperature, etc.) related to balloon movement. Since this variety of data is of definite use to scientists involved in STRATOS experiments and to the general public, it is freely disseminated and accessible to all.

Give us a solution that will make it easier to consult this information and that will highlight this data on the environment of the stratosphere.

Stratos: the CSA stratospheric balloon program (Credit: CSA)

2019 Space Ottawa NASA Global Nominee Example – Team Moon Cake

Video: Team Moon Cake. https://www.youtube.com/watch?v=PCjBTGjpnDU
More information on the project: https://2019.spaceappschallenge.org/challenges/our-moon/art-side-moon/teams/mooncake/project

"Your challenge is to create an artistic work to communicate, inform, or inspire others about humanity's return to the moon."

"We created a short animation about a child who is told a bedtime story about the moon and its residents. We wanted to incorporate recent events into our project such as the first all-female spacewalk on Friday and the plan for the first woman on the moon by 2024. Our target audience is children, because they are the next generation, and we also wanted to spark imagination by referring to the many myths and legends about the moon."

Government of Canada's Support for Space Apps

- The Canadian Space Agency is the primary federal organization supporting Space Apps in Canada, assisted by others such as Natural Resources Canada.
- CSA effort led by Access to Information and Open Data team and includes support from scientists, engineers, and astronauts
- CSA developed its first data strategy in 2019 and included community engagements, such as hackathons, to facilitate the use of data and access to science
- Why is the CSA involved?
  - Major benefit: Raising awareness of CSA mandate and missions. Educational outreach opportunity to educate participants on CSA missions (ex RCM, NEOSSat, or recent David Saint-Jacques mission)
  - Create links by informing university students on how they could become interns
  - Promote STEM careers especially to under-represented groups
  - Help CSA unlock the value of its data with the help of data users
  - Support Open Government Initiative.

Canada's Open Government Initiative

- "Canadians are best served by open, accountable and transparent government that builds trust in public institutions. In that spirit, it is important that we continually and collectively stress the importance of scientists in the Government of Canada speaking freely about their work."
- 2020 Open Government Roadmap being worked on. Item #5: Open Science:
  - The Government of Canada will make federal science, scientific data, and scientists more accessible.
  - develop a Canada Open Science Roadmap to provide a plan for greater openness in federal science and research activities
  - provide a platform for Canadians to find and access open access publications from federal scientists
  - raise public awareness of federal scientists' work and of open science
  - promote open science and solicit feedback on stakeholder needs
  - measure progress in implementing open science and the benefits it can provide
  - https://open.canada.ca/en/content/canadas-2018-2020-national-action-plan-open-government#toc8

NEW HORIZONS

Global Space Industry – Downstream Trends

- The rate of satellite launches and big data from space is exponentially increasing
- Data from space is non-standard, very large & complex
- New Space incubation is proceeding rapidly in USA, EU, Luxembourg, UK, many other countries
- Canada is becoming globally less competitive in space investment activity

Issues for Businesses Developing Downstream Space Applications

- Businesses are frequently unaware of availability of space-based data sets, unsure how to leverage them, or it is prohibitive to proceed
- Major software failure factors are:
  - unclear business requirements
  - lengthy development or planning times
  - lack of agile process
  - Deferring risks
  - Lack of end user engagement and change management
- These all appear to be major risk factors currently for downstream software development

Space Apps Benefits for Canada

- Space investment is generally a GDP multiplier. Space Apps is a low-cost and -risk way of getting outreach for space.
- Raise awareness with businesses that are not (currently) space-enabled
- Rapidly prototype to innovate and reduce risks, before proceeding with formal development projects
- Increase STEM skills (including under-represented groups)
- Educate our youth
- Promote job creation and growth
- Promote science and open data
- Tap into wealth of design, development, AI, big data experience in other industries

Canada's Unique Opportunity

- 5 years ago, very few young people had direct exposure to space and its interesting problems. Space Matters and Don't Let Go Canada campaigns are proof of need to educate
- If you want to gain political support for continued investment – maybe this should be part of your strategy.
- Canada is home to some of the world's best scientists, engineers, designers, programmers, AI and big data experts
- We have a long history of space exploration, satellite operations and engineering, and great data
- We have a great R&D and innovation infrastructure
- We have globally unique level of government support for Space Apps hackathons
- Therefore, we can create enduring success with some imagination, experimentation, and sustained investment

Limitations of current NASA International Space Apps Hackathon

- 48 hours is too short for real solutions to be developed*
- Time must be spent familiarizing with the data before even thinking about what is possible
- There is no distinction between “concept generation/solution exploration” and actual development of a solution
- The “solutions” are actually “hacks” without mechanism/incentive to turn them into production-ready code
- Primary benefit of a single 48-hour hackathon is raising awareness, not likely to generate real world solutions
- Each annual hackathon is a “one time” event, without a framework for follow-up
- Organizer and sponsor investments in the hackathon are therefore expensive in terms of time, money, energy
- There is little incentive or budget for organizers to invest in longer-term processes, tools, documents
- Complex branding and organizing: globally it’s NASA event, locally it’s Canadian

* Usually.

Concept: Space Apps Hackathon+

- Multi-phase virtual hackathons to build specific software solutions.
- Flexible framework maximizes organizing investments, sponsorship, participation
- Phases alternate between 48-hour “concept” hacks and 7-day “development” hacks
- Cash prizes/incentives, virtual events to maximize participation and results
- Open source solutions encourage reuse and commercial development
- Multiple hackathons could be run in parallel, in partnership with other industries (ex for agriculture, resource extraction, urban planning)

Next Steps

- Spread the word: tell your family, friends, colleagues about Space Apps hackathon
- Get involved!
  - As an organizer, sponsor, volunteer, participant
  - www.spaceappsottawa.com
  - www.spaceappschallenge.org
- Interested in discussing Space Apps or the Hackathon+ concept?
  - Email nkellett@deploy.solutions


Help us reach
new horizons.