

NASA Tournament Lab 10 Topics Overview

General

- Make the videos more digestible
- Give presentation to folks at NASA and also given to FB
- Audience: anyone looking for a different way to solve problems
- Mandatory: make sure not falling into “NASA” hole of spitting out acronyms, still want non-space / NASA fans to understand

Topic 1: A NASA Tournament Lab Overview

- This video is intended to be a general overview of the NTL and what we do. Sort of an introduction to who we are.
- **Definition: The** NASA Tournament Lab (NTL) facilitates the use of crowdsourcing to tackle NASA challenges. Since 2011, NASA’s researchers, scientists, and engineers have launched numerous challenges through the NTL, often seeking novel ideas or solutions to accelerate research and development efforts, improve algorithm performance, and seek new ideas and approaches in support of the NASA mission. The NTL offers a wide variety of open innovation platforms that engage the crowdsourcing community in prize competitions to create the most innovative, efficient and optimized solutions for specific, real-world challenges being faced by NASA and other Federal Agencies. For more context view: <https://www.nasa.gov/coeci/ntl>
- Interesting stats to mention:
 - + Nasa Tournament Lab has conducted over 380 challenges
 - + 94% have been successful
 - + 80% resulted in cost savings
- NASA's Vision: To discover and expand knowledge for the benefit of humanity.
- The NTL assists the agency in achieving this vision by finding solutions to some of NASA’s biggest challenges.
- Been around since 2011
- The NASA Tournament lab also assists other federal agencies in the use of crowdsourcing. Similar to NASA challenges, these agencies tap into the crowd and hold prize competitions to find solutions to their problems.
- Key messaging: NASA is an expert in innovation, but we still have unsolved problems. The NASA Tournament Lab helps the agency explore the plethora of novel ideas and solutions that exist outside NASA.

Topic 2: A NASA SOLVE Overview

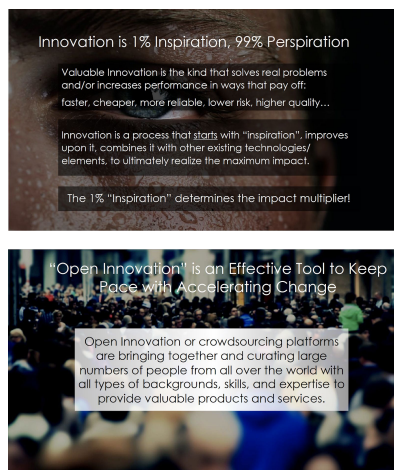
- **Definition:** NASA SOLVE is an invitation to members of the public to contribute their time and expertise to advancing research, solving problems, and potentially winning prizes as a result of their work. This initiative can take the form of crowdsourced challenges with prizing, citizen science projects, competitions aimed at advancing student education, and many other variations.. For more context view: <https://www.nasa.gov/solve/index.html>
- This video is intended to show the menu of crowdsourcing options NASA provides beyond the NTL.
- From this site: <https://www.nasa.gov/directorates/spacetech/programs>
 - STMD's Prizes and Challenges portfolio supports the use of public competitions and crowdsourcing as tools to advance NASA R&D and serve other mission needs. It includes Centennial Challenges, which stimulates research and technology solutions to support NASA missions and inspire new national aerospace capabilities through public prize competitions. It also includes the NASA Tournament Lab (NTL), which enables employees at NASA and other U.S. federal agencies to use crowdsourcing approaches to procure novel ideas or solutions to serve R&D and others efforts in support of the NASA mission. The Prizes and Challenges portfolio makes opportunities available for the public to participate in NASA R&D and other mission needs through NASA Solve website.

Topic 3: Why is innovation important?

- **Definition:** Innovation is an important aspect of progress as it taps into new avenues and areas of potential. Rather than the linear growth seen in revisions and improvements on established methods, true innovation leads to exponential growth in standards, efficiency, and efficacy as it represents a previously unexplored area of potential.
- Innovation is what landed human boots on the moon. Innovation is what leads us to discover worlds in distant galaxies. Innovation is what allows us to monitor the health of our home planet.

- Valuable Innovation is the kind that solves real problems and/or increases performance in ways that pay off: faster, cheaper, more reliable, lower risk, higher quality...
- Innovation is a process that starts with “inspiration”, improves upon it, combines it with other existing technologies/ elements, to ultimately realize the maximum impact.
- Open Innovation or crowdsourcing platforms are bringing together and curating large numbers of people from all over the world with all types of backgrounds, skills, and expertise to provide valuable products and services.
- Key messaging: NASA is an expert in innovation (highlight some NASA accomplishments -- moon landing is most obvious, but recent things are good too). But we still have unsolved problems and unmet needs. Expanding our sights to open innovation/crowdsourcing can help us find solutions and continue to innovate.
- We don't want to say NASA isn't already innovative. But there's a difference between innovation and open innovation. NASA could leverage open innovation in order to be more innovative

Page 4 and 23 of the powerpoint describes open innovation:



Topic 4: What is crowdsourcing and how does NASA use it? What are some general barriers to running challenges?

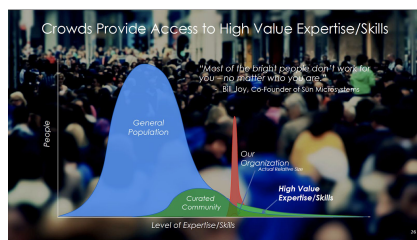
- Discuss the various capabilities provided by vendors, but do not name vendors specifically in this video. Only name them in the example challenge videos
- Discuss general size of the crowd with all vendors combined -- over 70 mil
- Point to the challenge worksheet and/or nasa.gov/coeci site
- Include NTL menu of challenges/prices

- Can include specifics about micropurchase -- Micro-purchase challenges are challenges that agencies can do with just a government purchase card -- so a total of less than \$10,000 spent on the entire challenge

Definition of crowdsourcing: It is a collaborative innovation tool that poses seemingly specialized problems to a broad audience. By broadening the range of participants innovating against the problem, you are able to cut across areas of applicable experience that would traditionally remain silo'd, increase the number of “shots on goal” that lead up to successful innovation, and extend your conglomerate knowledge beyond the bubble of technical experts.

How does NASA use crowdsourcing: NASA access the talent and prowess of the crowd through prize competitions and challenges. These competitions are hosted by crowdsourcing platforms contracted through NOIS (NASA Open Innovation Services) contracts. Participants can submit ideas, participate in challenge discussions and even collaborate with other solvers to find solutions.

Page 26 of powerpoint slides speaks to why crowdsourcing is important.



Page 27 of powerpoint demonstrates how NASA uses challenges to crowdsource solutions.



Topic 5: Technical Problem Solving Challenges Overview

- Page 45: Using challenges with diverse communities to find unique and innovative approaches to optimal/best problem solutions
- Page 46: Case study -- [space poop challenge](#)
- Page 47: Case study -- [earth & space air prize](#)

- Page 48: NASA has conducted 40+ technical solution projects to date
- [Data-Driven Forecasting of Solar Events](#)
- [Using “Dead Weight” on Mars Spacecraft to Advance Science and Technology](#)
- Potato chip -- in presentation
- This is our broadest type of challenge

Topic 6: Technical Searches Overview

- Page 50: Using crowd-based networks to find technologies invisible to most internet searches. Given the vast amount of tech development globally and proprietary nature of some of the most cutting edge, the use of crowdsourcing to find these technologies is more efficient than a typical Google search.
- Page 51: Case study -- Tech Search for Automotive Sensors that can be applied to a Lunar Lander
- Page 52: NASA has conducted 28 technology searches to-date
- [Strain Measurement of Vectran and Kevlar Webbing](#)
- [Non-invasive Measurement of Intra-cranial Pressure](#)
- Subsea7 - in presentation

Topic 7: Data Science/Machine Learning/Algorithm Challenges Overview

- Page 53: Using challenges with expert communities to develop/improve algorithms
- Machine learning and data science communities are typically very passionate about what they do
- Page 55: Case study - Robonaut vision algorithms
- Page 56: Case study - Passenger screening challenge
- USAID Indicators of Vulnerability Challenge (do not have active link but can provide information)
- [Enhancing MDA to Combat Illegal, Unreported, and Unregulated \(IUU\) Fishing](#)
- Page 57: NASA has conducted 20 other algorithm/data science projects to-date

Topic 8: Software Challenges Overview

- Using Challenges with Expert Communities to Develop Software Solutions.
- Page 59: Software is a major component of NASA operations. It allows for increased autonomy and complexity in its systems. Software, specifically data science, machine learning, automation and robotics, is an ever changing field, and NASA is challenged to keep up with the pace.
- Page 60: Crowdsourcing/Topcoder provided a way to recruit software experts from outside NASA who could not only provide solutions but innovative perspectives from outside NASA. There's a graph in the powerpoint that shows

an overview of the process, how each contest taps into the best of the portion of the community that has expertise for that phase.

- Page 62: Case study - ISS Astronaut Food Intake Tracker - Dr. Smith & Dr. Zwart needed a better way to collect nutritional data on ISS. They used NASA@WORK and Topcoder. Page 62 shows overview of process.
- Page 64: Case study - Solar System Treks - Emily Law, lead of Solar System Treks Project, needed to reduce processing time for LRO data into mosaic images. Using Topcoder, they found a multi-node processing solution that reduced time from 19 to 3 hours.
- Page 66: Explains the concerns with crowdsourcing - Software security is a natural concern for crowdsourcing, but there are a number of precautions one can take.
- Page 65 and 67: Shows 29 software development projects to date and active software & algorithm contest to-date.

Topic 9: Creative Design Challenges Overview

- NASA now uses crowdsourcing platforms to contract freelance designers for their program graphics. This is advantageous because it not only opens up the project to talent beyond NASA, but also sources artists who have opted-in to the project thus resulting in higher quality work.
- Supplemental - complements personnel skills - allows for coverage during burst times.
- Examples include Cinespace, Asteroid Grand Challenge, DTN explainer animation and REALM video contest
- You could even mention this video series if you want to be super meta
- For graphics + videos challenges overview, remind folks that they still need artists and creatives to look at data and make it understandable for the general public. A good reminder that NASA doesn't just focus on STEM work.