Hack your Creativity:
Using Hardware, Software, Coding, Music, and Art

Arushi Nath (Grade 8)

Global Winner: NASA SpaceApps 2020

National Winner: Canadian SpaceApps 2017

Global Nominee: 2014, 2017, 2018, 2019

HotPopRobot.com

Twitter @Wonrobot

1 October 2022

Toronto, Canada

My 9th NASA SpaceApps Challenge

Participant: 7 years. **Mentor, Presenter, and Judge:** 2 years

2014. Curious Bot. Global Nominee
Top 5 People Choice Award

2015. Apollo 11 / Saturn V Model

2016. MARS Stereo Vision Rover

2020. The Masked Scales
Global Winner COVID19 Challenge

Drop the Drought
Think Big, Do Big

2017. Yes I Can. Canadian Space Apps Winner.
Drop the Drought: Space Apps Toronto Winner

2018. Deep Space Musical
Space Apps Toronto Winner
+ Global Top 25

2019. Schools and NASA aiding Climate Action (SNACK). SpaceApps Toronto Winner + Global Nominee

Participated in 40+ Hackathons

Problem Solving is Fun!

Learned how to communicate, code, build communities and be creative

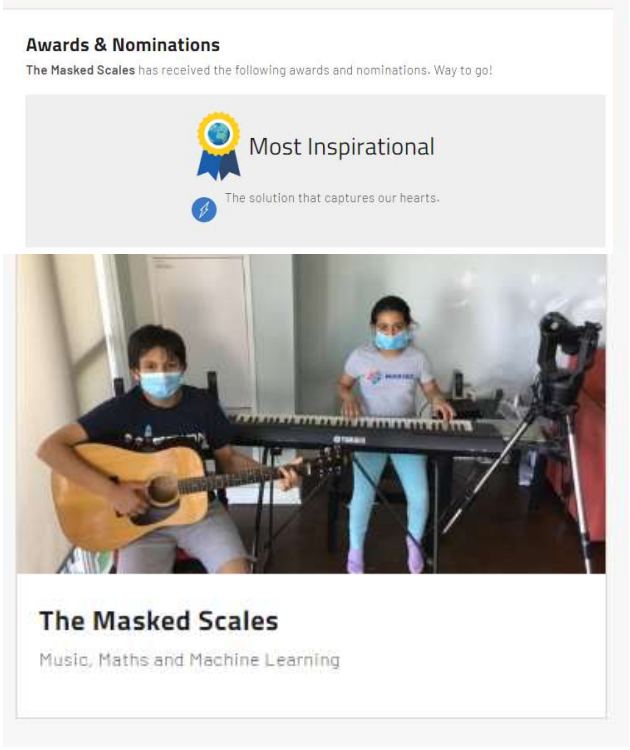
ElleHacks
DroneHacks
Elevate Hackathon
BMT Hack
Genesys
Get Your Bot On
NeuroTech Hack

ProtoHack
Clockathon
NASA SpaceApps
Canadian SpaceApps
Mission Hack
CODE Hack
IOT Hack

Hack’nTalk
Hack for Good
Hacking Health
Hardware Hack
Climathon
ARIEL Hackathon
PixelHack

Yes I Can / Oui Je Peux:
2017 National Canadian SpaceApps Winner

Mosaics made from rearranging image pixels from the Canadian Satellite Radarsat-2



The Masked Scales: 2020 Global Winner (Covid-19 Challenge)

SpaceApps Opens Up New Experiences:
Meeting Canadian Astronauts at Canadian Space Agency HQ!

Canadian Astronaut
Jeremy Hansen

Canadian Astronaut
Jenni-Sidey Gibbons

Canadian Astronaut
Joshua Kutryk

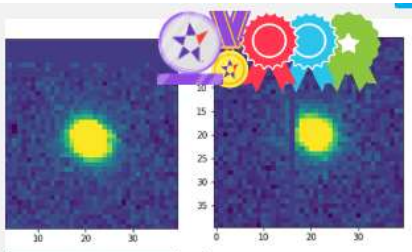
Canadian Astronaut
David St-Jacques (virtually)

Everyday is a Hackathon:

Learning new things by solving “Hard” Problems

Plankton Wars and Planetary Defense take best project awards at this year’s CWSF

CWSF 60 YEARS 60 ANS 2022 ESPC



EDIT

Strengthening Planetary Defense: Detecting Unknown Asteroids using Open Data, Math, and Python

Asteroid collision risks are real and unpredictable. 66 million years ago the Chicxulub asteroid impact wiped away the dinosaurs. My project strengthens planetary defense by using robotic telescopes, open data, math, and python to find unknown asteroids.

SEE MORE

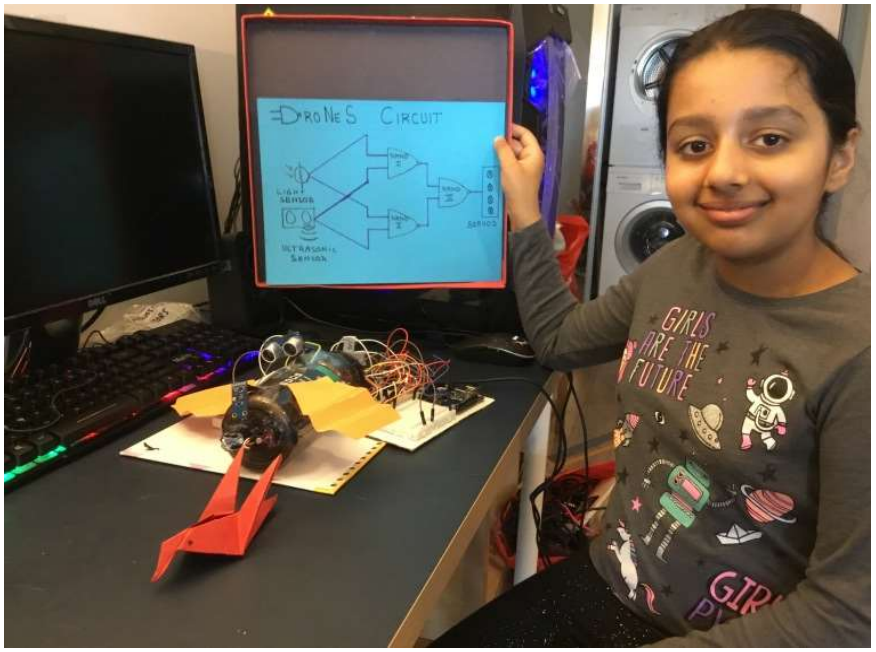
TEAM

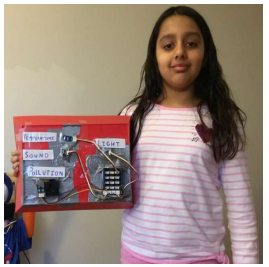
- **Best Project Award - Innovation**
- **Excellence in Astronomy Award (Junior)**
- **Gold Medal (Junior)**
- **Youth Can Innovate Award (Junior)**
- **Challenge Award - Curiosity and Ingenuity (Junior)**

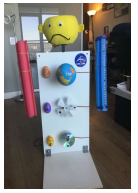
Hardware Projects

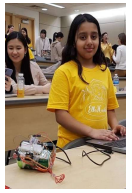
When I build things
I am no longer a
“consumer”

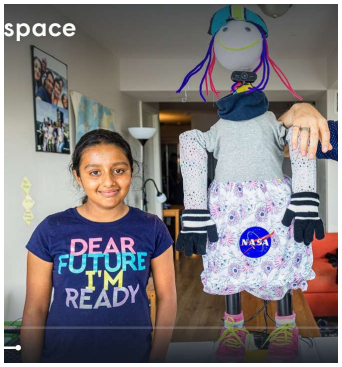
I am:
An engineer
A creator
A maker

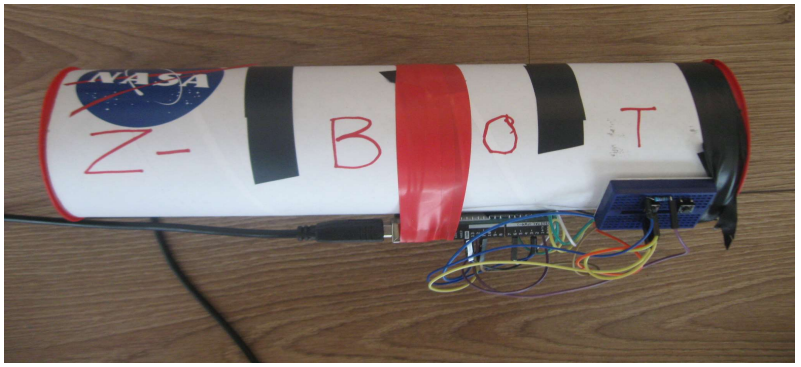




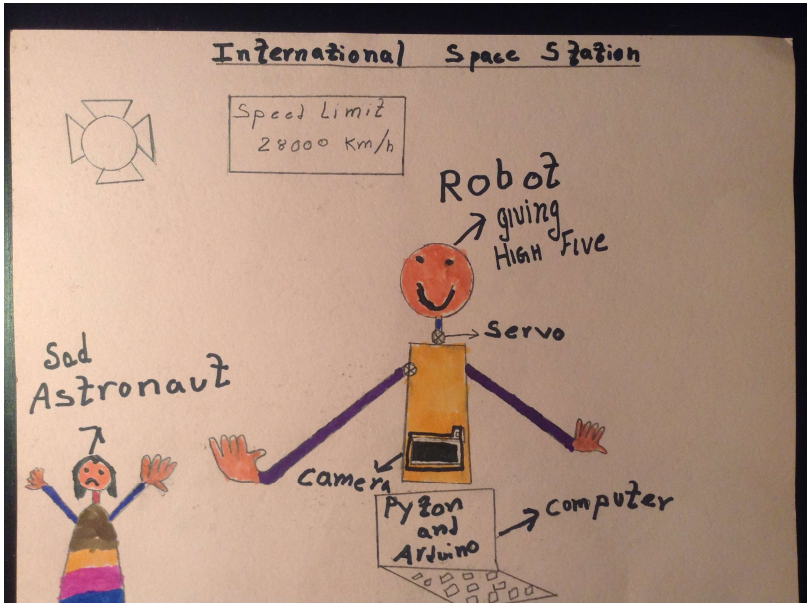


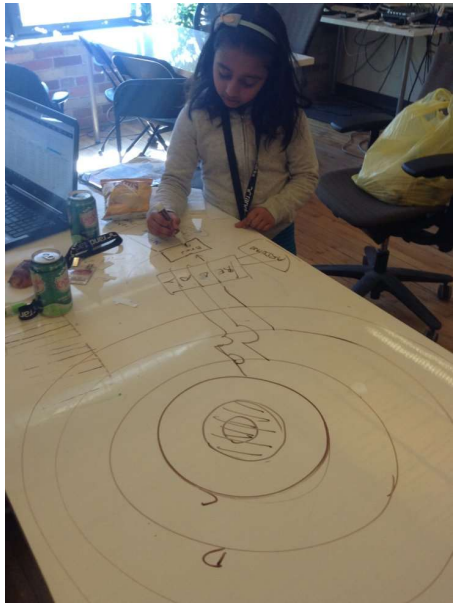


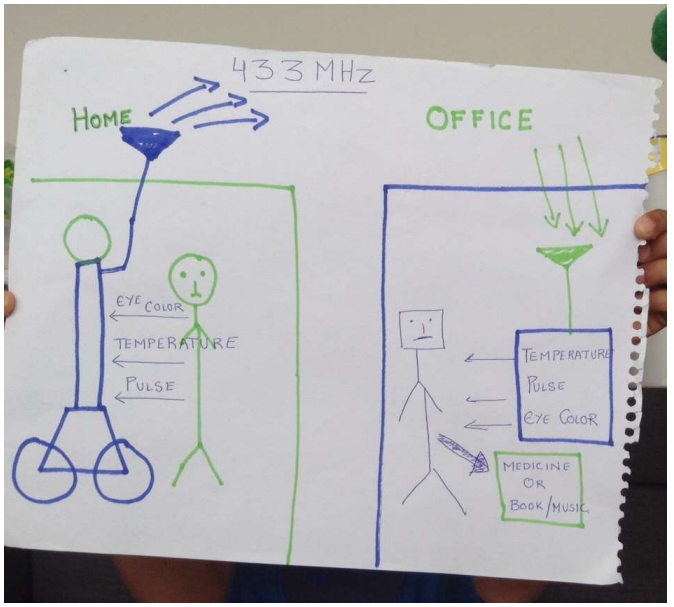


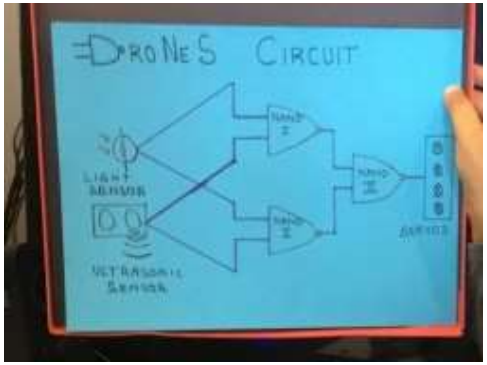


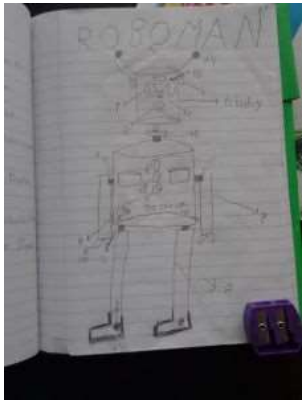
Ideas Improve When You Sketch



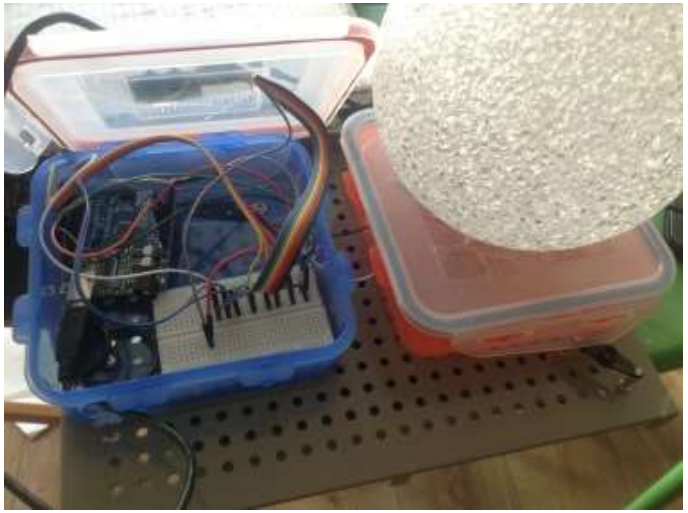


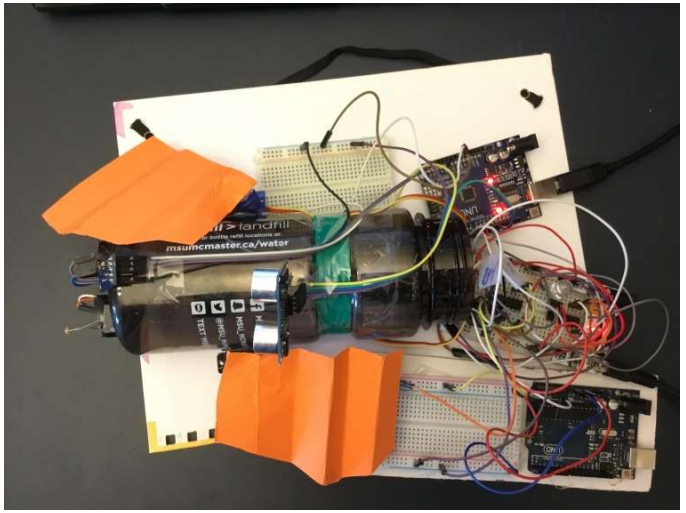




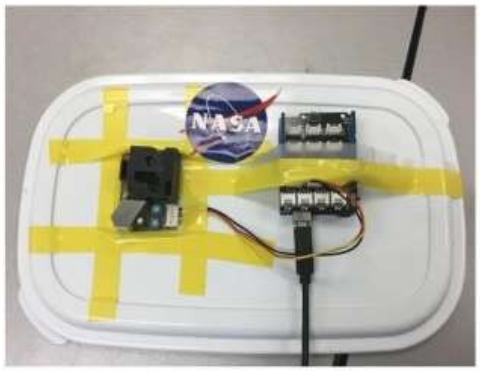


Hacking old toys, sensors, motors, LEDs to create prototypes from sketches!





Schools and NASA Aiding Climate Action by Kids (SNACK)
Toronto SpaceApps Winner 2019 and Global Nominee



Uses Arduino and Particle Sensor

Programming it

École élémentaire Jeanne-Lajoie

École élémentaire Gabrielle-Roy

École élémentaire Félix-Leclerc

École élémentaire Laure-Rièse

Using satellite imagery to measure green cover in Toronto Schools

Collecting primary data at street crossings

Software and Coding Projects

A few lines of <code> and:

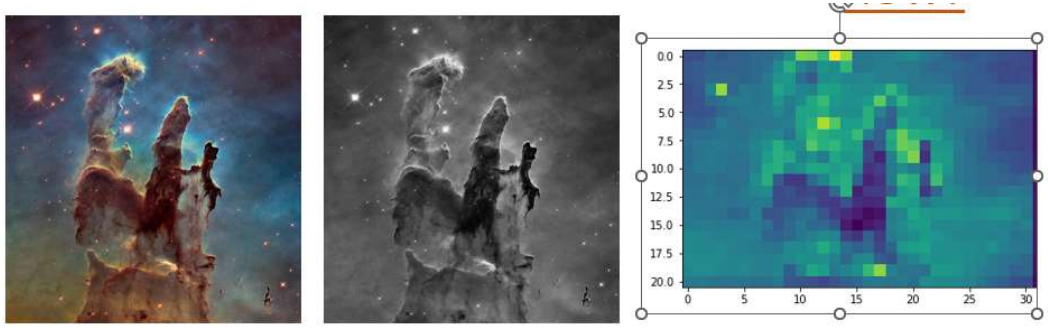
Paper Plans transform into Prototypes

Programming Movements: Arduino IDE

Analysing Data: Python

Visualising Data: Plot.ly

Designing Apps: MIT app inventor, Dash

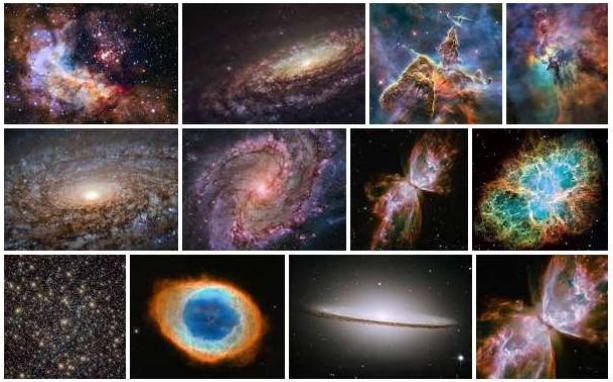


Actual Hubble Image

RGB (Red Green Blue) → Gray Scale → Pooling

```
x = skimage.measure.block_reduce(x, (3,3), np.max)
x = skimage.measure.block_reduce(x, (4,4), np.mean)
nim = skimage.measure.block_reduce(x, (4,4), np.mean)
```

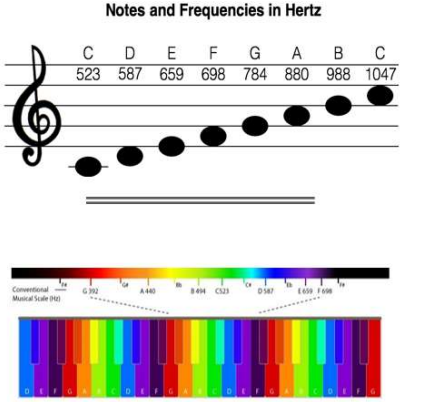
HUBBLE Deep Space Musical
Toronto SpaceApps Winner 2018 and Global Nominee

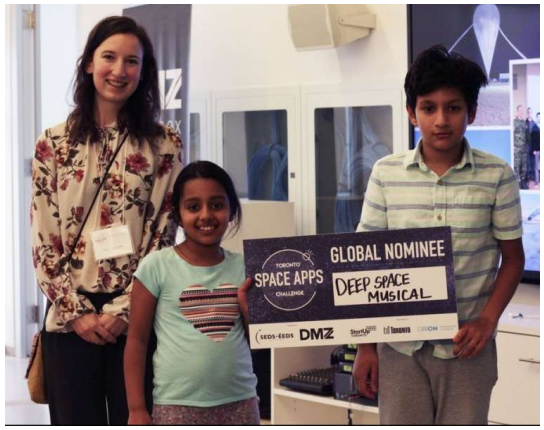


```
notes = np.ndarray.flatten(nim)

notes=list(notes)

for item in notes:
    if item < 30:
        finalnotes.append(item*10)

    elif item < 50:
        finalnotes.append(item*4)

    elif item < 150:
        finalnotes.append(item*5)

    elif item>150:
        finalnotes.append(item*15)


for n in range(0,672):

    winsound.Beep(int(finalnotes[n]), 350)
    print(n)
```

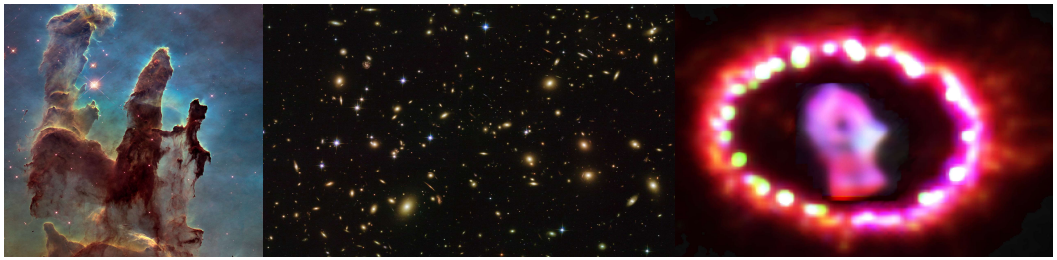
Transformed Pixel Values into Frequencies and Notes!

Every pixel of Hubble Color Image is associated with a musical note



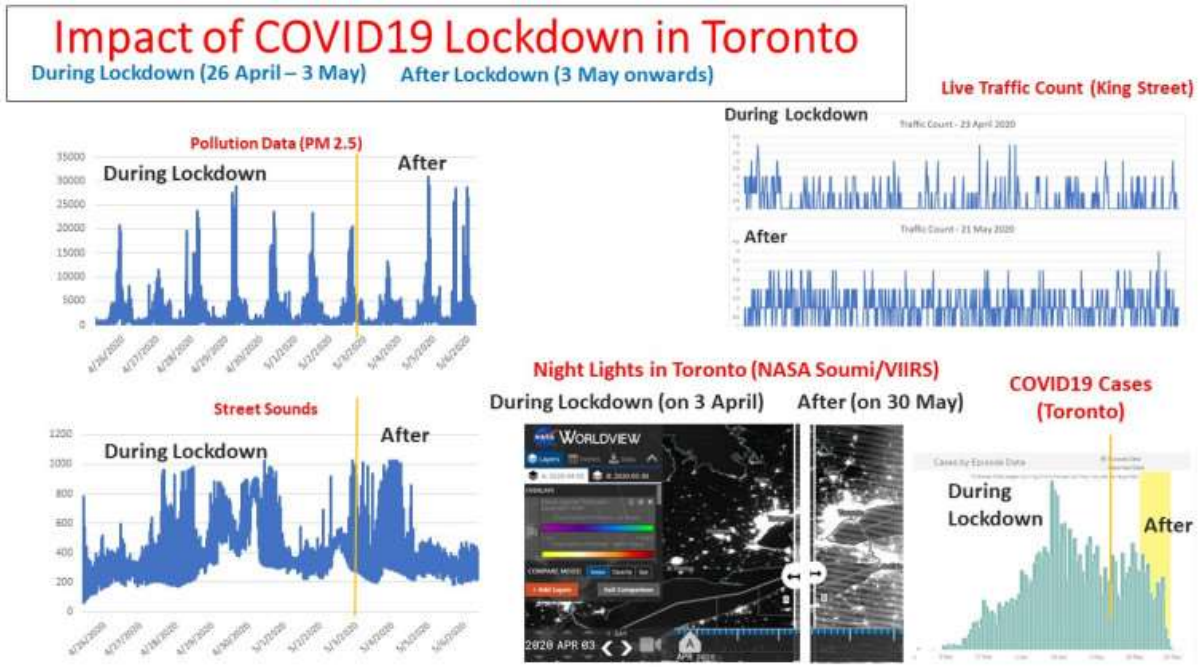


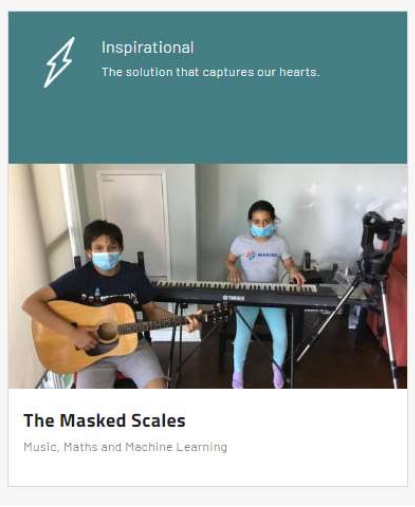
Birth of Stars **Galaxies of Stars** **Star Death**



Using Data Sets in SpaceApps Challenges

NASA Datasets, Sensor and Simulate Dataset





Data Collected from Home-Made Instrument

1. Street Noise (Microphone)
2. Vehicular Emissions (PM 2.5 Sensor)
3. Vehicular Count on Street (Intel RealSense Camera)
4. Light Intensity Data (Light Sensor to analyse day and night data)

External Data Sources

1. NASA Night Light Data (Suomi / VIIRS Data)

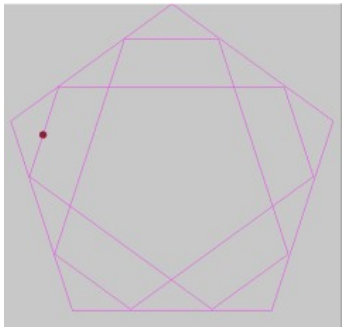
https://worldview.earthdata.nasa.gov

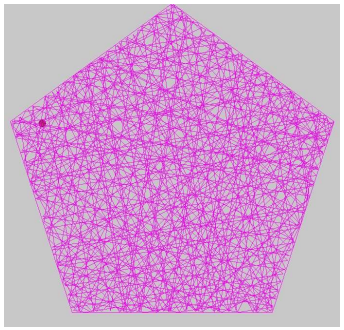
2. Toronto COVID19 Infection Data (City of Toronto)

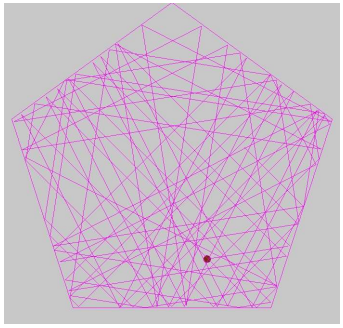
https://www.toronto.ca/home/covid-19/covid-19-latest-city-of-toronto-news/covid-19-status-of-cases-in-toronto/

Demo: Make Your Data Dance and Sing!

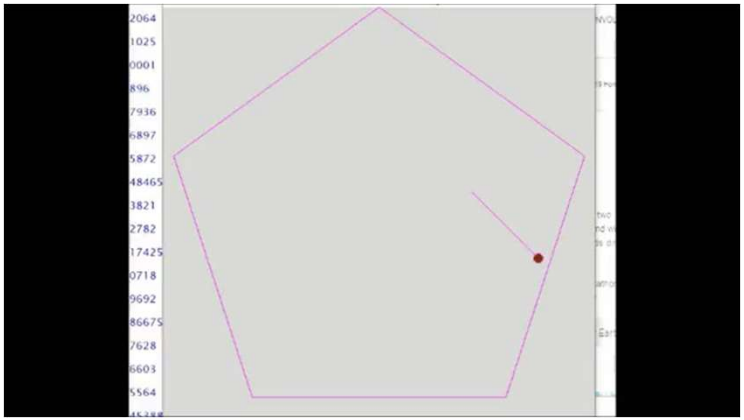
A data-driven visual / animation is better than 100000 data points







```
delay = 5
radius = 30
R = WIDTH / 2
angles = []
points = []
segments = []
vectors = []
dists = []
long_trace = []

trace = []
trace_length = 40

def setup():
    size(2*int(R),2*int(R))

    for i in range(n):
        theta = 2 * math.pi * i / n - math.pi / 2
        px = R * math.cos(theta) + R
        py = R * math.sin(theta) + R
        angles.append(theta)
        points.append([px, py])
```



How to create a Cool SpaceApps Project?

Challenge — Pick the challenge the excites you the most!

Listen — No idea is big or small. It is what you do with them that matters! So, listen to everyone's ideas!

Connect — Connect to wider SpaceApps community.
Tweet to an expert for advice!

Creative — Be creative, combine different skill sets with your challenge

Conversation with Canadian Astronaut: Jeremy Hansen (2017)

Show is always better than Tell!

Use your hardware, software, and coding skills to present a:

- Prototype
- Wire frame
- App
- Demo

Presenting your project

Make a story line:

- *the problem*
- *your solution*
- *How you made your solution*
- *Demo*
- *Challenges faced*
- *Future of your project*

Make few slides to go with your presentation

Talk with your teammates and decide who will talk about what

Practice your presentation

Hack your Creativity:
Using Hardware, Software, Coding, Music, and Art

Arushi Nath (Grade 8)

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HotPopRobot.com

Twitter @Wonrobot

1 October 2022

Toronto, Canada


Door 1


ONTARIO SCIENCE CENTRE
INTERNATIONAL DAY OF WOMEN AND GIRLS IN SCIENCE
February 11
SPOTLIGHT ON WOMEN IN SCIENCE
Scientists come in many shapes and sizes. Hear from inspiring women who work in STEM and ask them your questions. What makes a good scientist might surprise you!
11 a.m. – 2 p.m.
Hot Zone, Level 6
Robot Reset
Robots don't have to be boys – or girls! Use laser-cut cardboard and your imagination to build a robot friend with moveable parts.
10 a.m. – 5 p.m.
Inventorium, Level
SCIENCE NEEDS WOMEN
#February11
Canada


CIBC Portal