UNISEC
University Space Engineering Consortium

NEPAL *

*Concept

CubeSats, Space Education in Nepal and the Question of Moving Forward

Connecting the dots to UNISEC

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Kyushu Institute of Technology, Japan

12.09.2020

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*editor@madeinepal.com

Behalf of Nepal POC

Dr. Anup Jung THAPA**

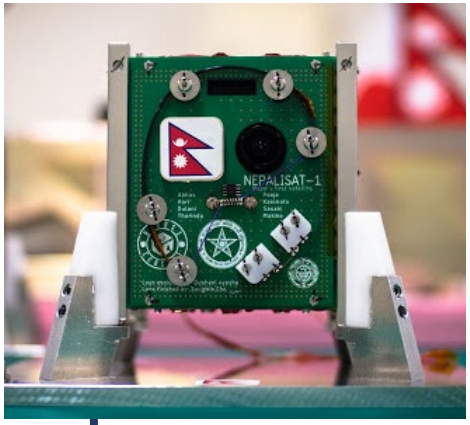
**anup.thapa@ku.edu.np

Kathmandu University

v1.0

Agenda

*Concept



CubeSats, Space Education in Nepal and the Question of Moving Forward

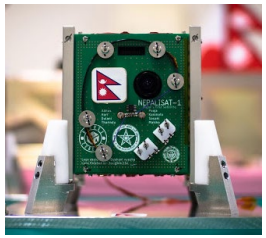
- **CubeSat: NepaliSat-1 from BIRDS-3**
- Space Education: SastoSat Grassroots
- Moving Forward:
  Where do we go from here?
  What makes sense?
  How do we progress post-pandemic?

Twitter-scape: PM speaks

*Concept

K P Sharma Oli @kpsharmaoli · Apr 18, 2019

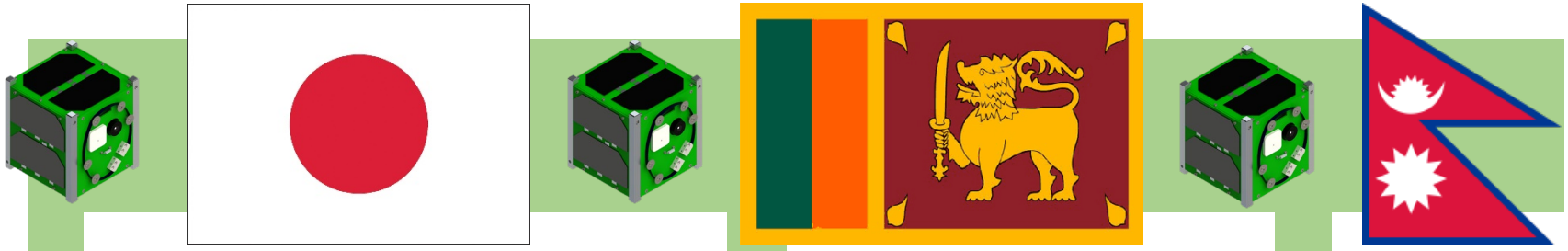
Though a humble beginning, with the launching of NepaliSat-1 Nepal has entered the Space-Era. I wish to congratulate all those scientists and institutions that were involved right from the development to its launching thereby enhancing the prestige of our country.



Media Generally Positive | Media Generally Negative

BIRDS-3 Satellites

*Concept



UGUISU

RAAVANA-1

NEPALISAT-1

Kyutech
Kyushu Institute of Technology

Nepal Academy of Science and Technology

Kyushu Institute of Technology
Japan

Arthur C Clarke Institute for Modern Technologies
Sri Lanka

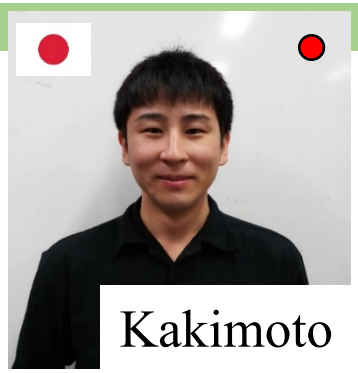
Nepal Academy of Science and Technology
Nepal

BIRDS-3 Team (2x Nepali)

*Concept

Pooja

EPS



Kakimoto

OBC

Makiko

Antenna
Ground Station

Sasaki

Structure

Dulani

ADCS

Tharindu

COM
LDM

Hari

EPS
BIRDS-4

Abhas

Project Manager
CAM
BPB

● Undergraduate（学部）
● Master's（修士）
● PhD（博士）

Timeline for NepaliSat-1

*Concept

First Gov. | **Second Gov.** | **Current Gov.**

Pre-CRA*
22nd Sep 2017

MoST Presentation
11th April 2017

Funding Approval
14th Nov 2017

नेपाल सरकार
अर्थ मन्त्रालय
MINISTRY OF FINANCE

Project Kick-off
1st Oct 2017

CRA Exchange
17th Jan, 2018

76.7% Payment
April 2018

100% Payment
Sep 2018

Operation

Press Release
Feb 15, 2019

*CRA: Cooperative Research Agreement

BIRDS-3 Project Timeline

*Concept

Mission Definition Review
[Post-MDR Modification 1.1]

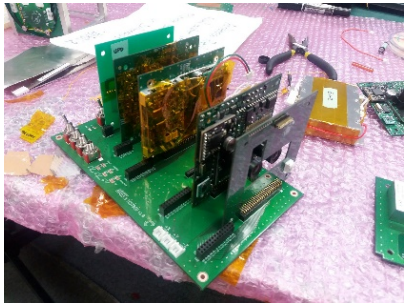
BIRDS-3 Team
28th Dec, 2017
Modification: 13th January, 2018

MDR
28th Dec 2017

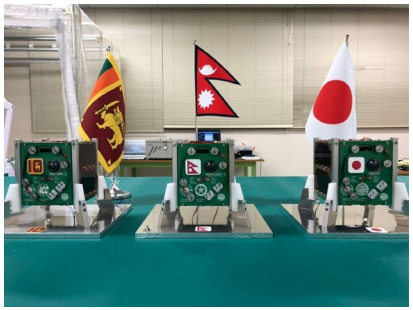
Kick off
4th Oct 2017

CDR
1st Sep 2018

PDR
24th April 2018



FM
Jan 2019

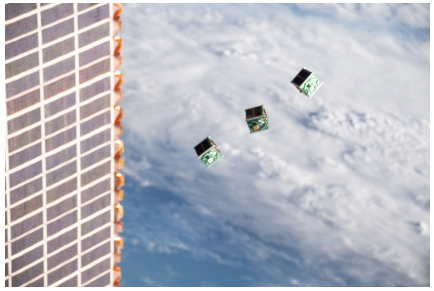


Delivery
Feb 18, 2019

Launch
April 17, 2019

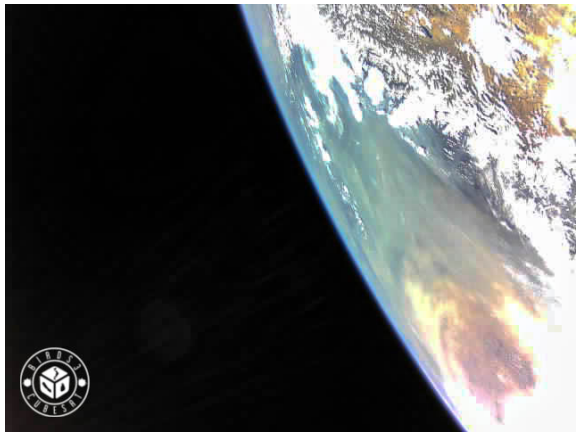
Operation

Deployment
June 17, 2019



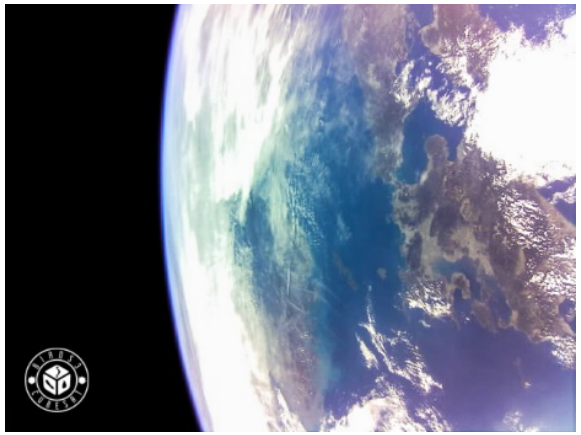
BIRDS-3 Image Gallery

*Concept

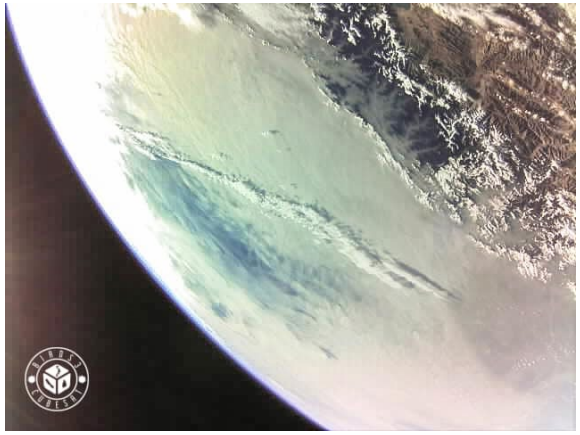


NEPAL

SRI LANKA

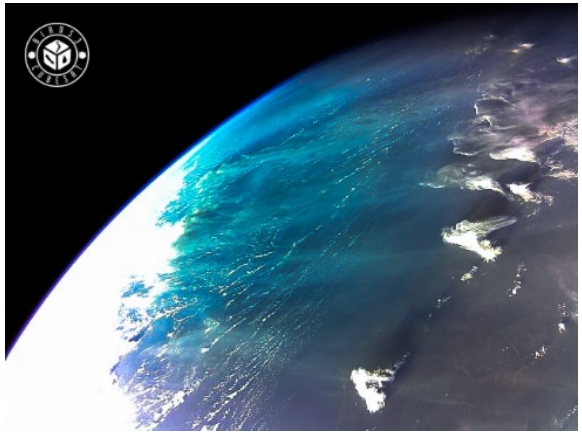


JAPAN



BHUTAN

MONGOLIA

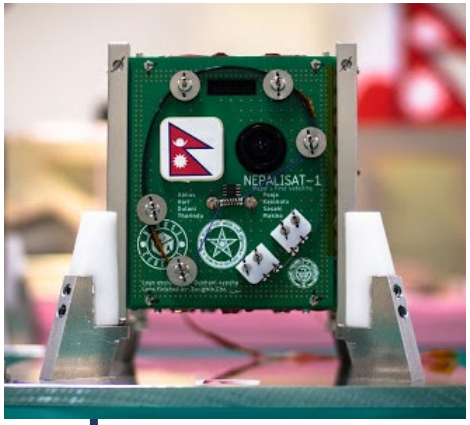


GHANA

https://birds3.birds-project.com/

Agenda

*Concept



CubeSats, Space Education in Nepal and the Question of Moving Forward

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- **Space Education: SastoSat Grassroots**
- Moving Forward:
  Where do we go from here?
  What makes sense?
  How do we progress post-pandemic?

Non-Government Side

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NESRA
Nepalese Space Research Association
http://nesra.co/

AMSAT NEPAL
http://amsat-np.org/

ORION SPACE
http://orionspace.com.np/

NESARC
Nepal Scientific Activities and Research Centre
http://www.nesarc.org.np/

APRSAF
Asia-Pacific Regional Space Agency Forum

NASO
https://www.nepalastronomicalsociety.org/

Nepal Government Side

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Nepal Academy of Science and Technology

https://nast.gov.np/

Government of Nepal
Ministry of Education, Science and Technology

https://moe.gov.np/

https://planeta-observatory.gov.np/

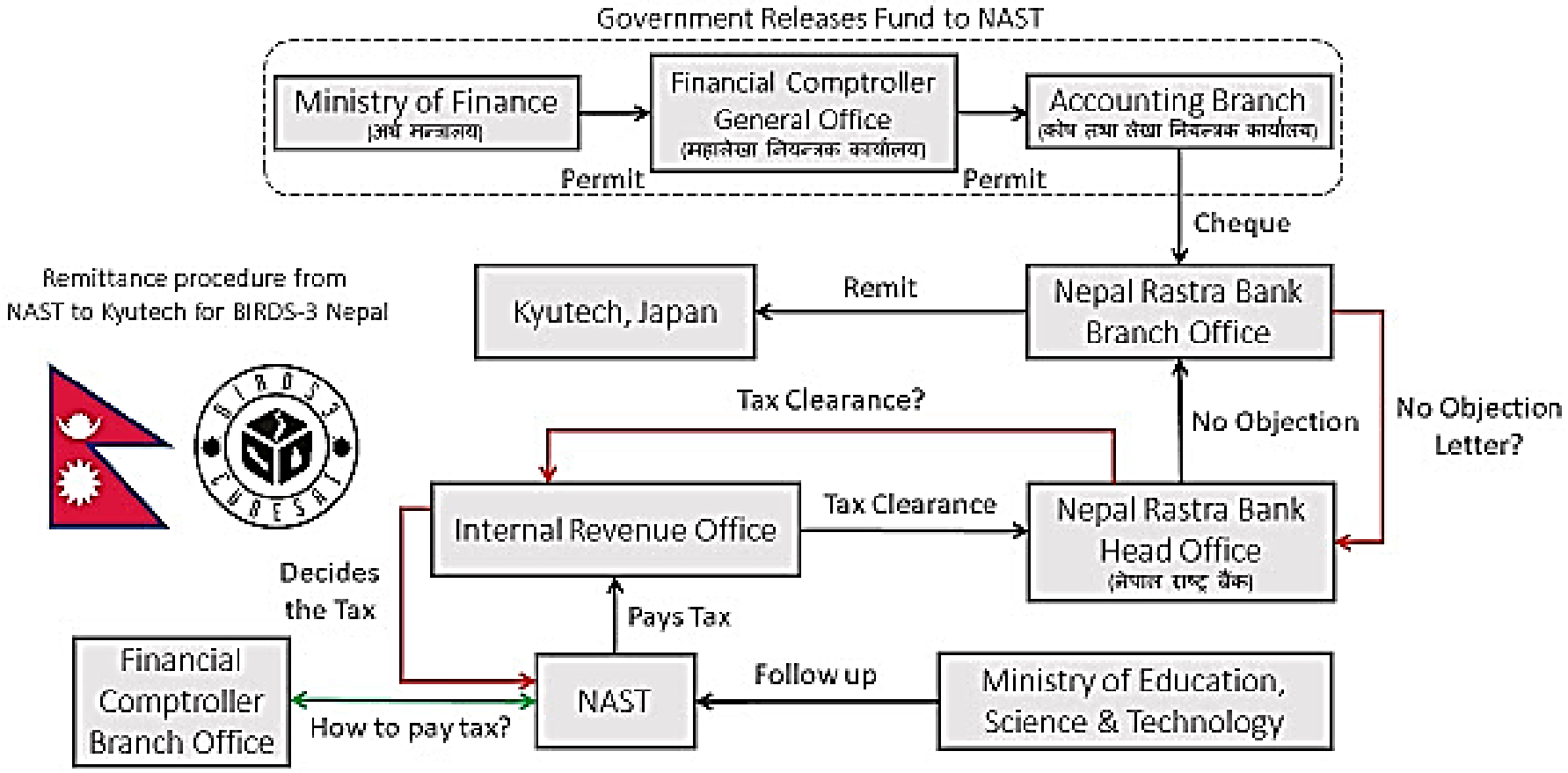
Challenges in Nepal

*Concept

- Funding and Taxation
- Manufacturing Base
- Component Availability
- Dollar Outflow
- Postal System (Logistics)
- Mobility
- Mass Exodus of Young People
- Public Schools are Sidelined
- Bureaucratic Red Tape

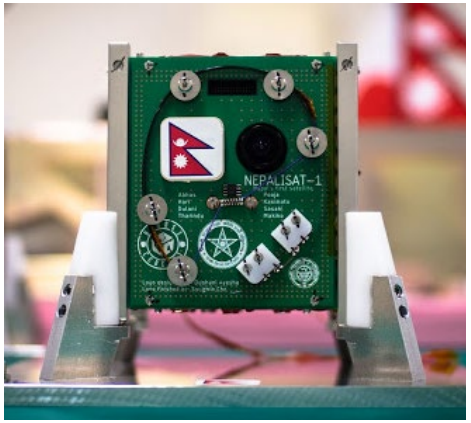
Payment Process for BIRDS-3

*Concept



Top Down Approach

*Concept



Infrastructure First

CUBESATS

SPACE EDUCATION

MANUFACTURING BASE

BASIC INFRASTRUCTURE

GOVERNMENT POLICY

CubeSat First

SastoSat Grassroot Timeline

*Concept

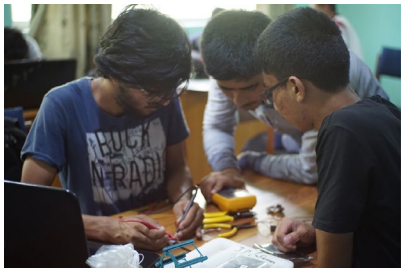
Korea CanSat Competition
August 2014

Pilot at Kathmandu University
December 2016

Brihaspati School
Oct 2018

New English School
Jan 2020

Hokkaido University (CLTP-7)
September 2016



IOE
Sep 2017

Brihaspati
Sep 2017

Brihaspati School
Oct 2019

SastoSat Grassroot Model

*Concept

Hokkaido University (CLTP-7)
September 2016

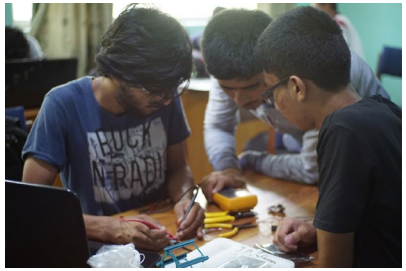
TRAIN

Kathmandu University
December 2016

Undergrad

TRAIN

Undergrad
Masters



IOE
Sep 2017

Grades 11-12

Brihaspati
Sep 2017

Older gen. trains new
Generation I trains II
Generation II trains III
…
Generation X-1 trains X

Reaching out Younger Generation
Age Generation X-1 >= X

Going beyond capital city

TRAIN

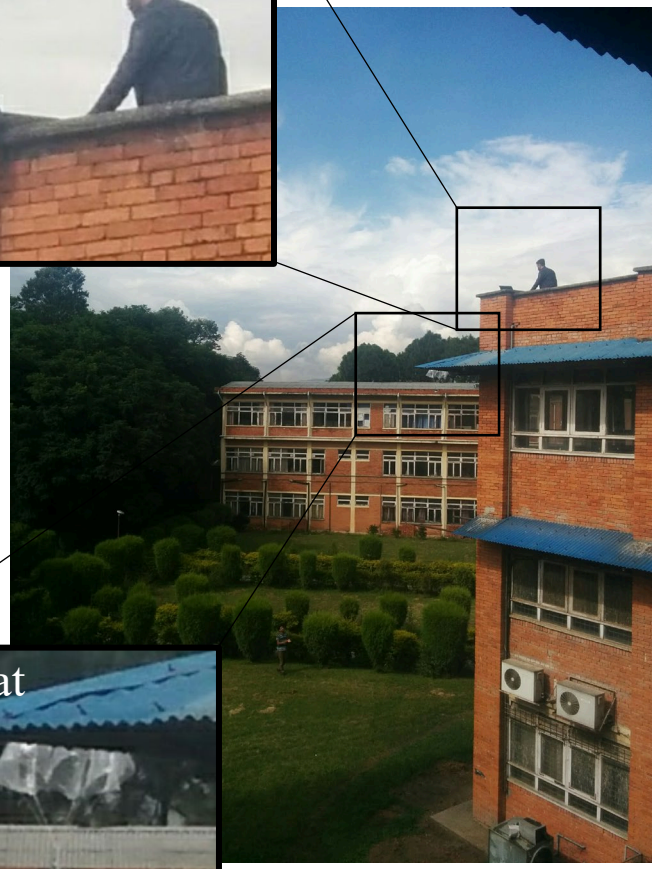
2018,2019

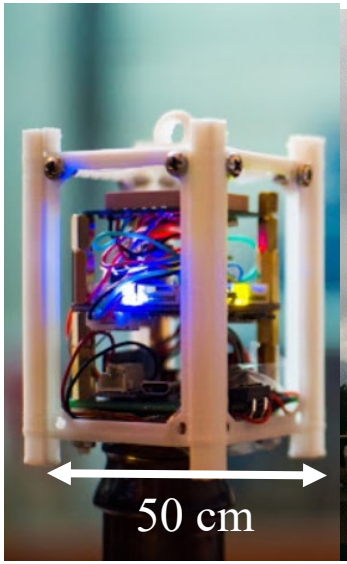
New English School
Jan 2020

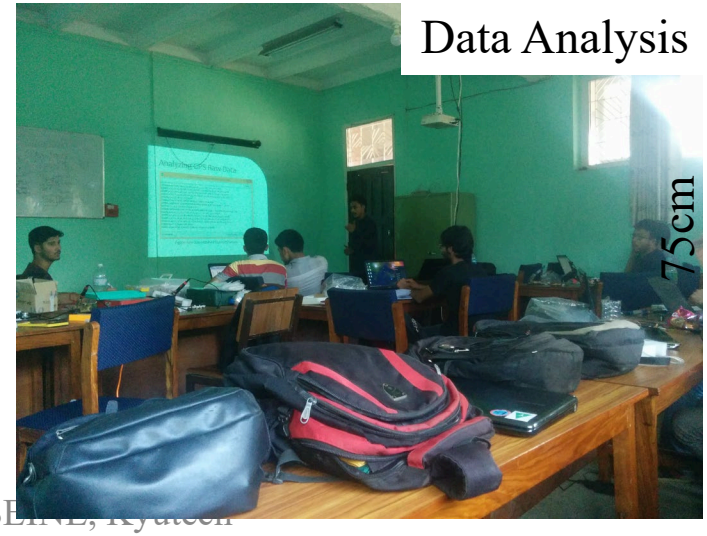
Grades 7-9

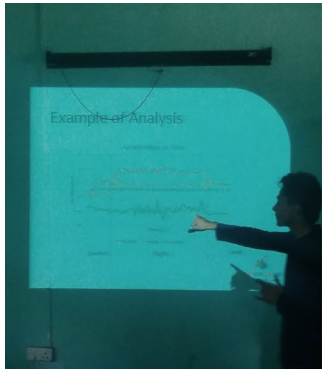
SastoSat Example on 2017

*Concept



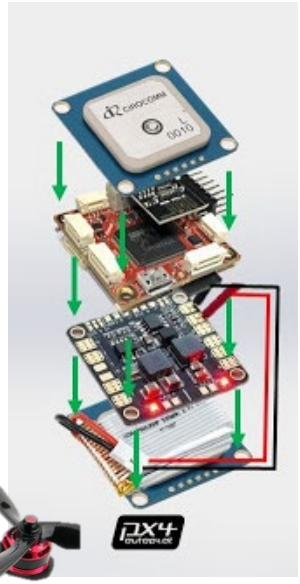






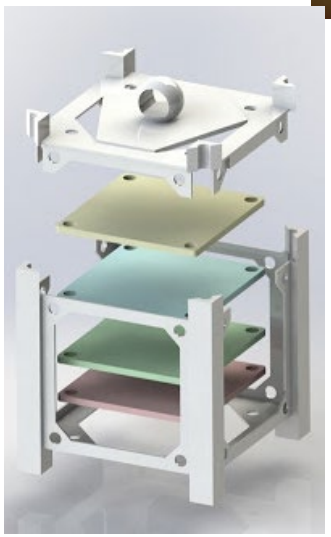
SastoSat 2017 Design

*Concept



Build

Design



Train

The Challenge Again

*Concept

THE WAY FORWARD FOR CANSAT EDUCATION IN NEPAL

SastoSat CanSat Uni Training v2.0 at Pulchowk Engineering in 2017.

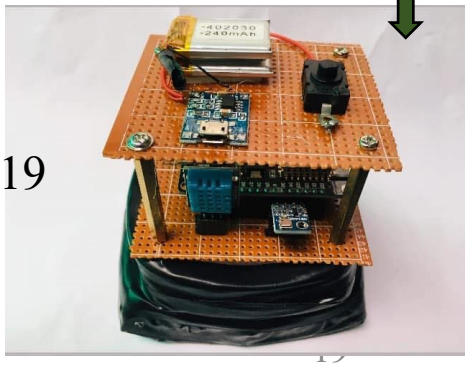
If, and that's a BIG if, Nepal is ever going to build it's own satellite in Nepal, there's two baseline things that need to be sorted out. Funding for getting the project going and most importantly, dedicated, diligent, capable and growth-oriented workforce. Both of them are extremely difficult to obtain as experience has shown, time and again.

However, if we are somehow able to leverage CanSats [CanSats? HERE] and take a long aim at the annual ARLISS [HERE] competition, things could seriously brew in our favor. Going to US (the competition takes place in Black Rock Desert), especially if you are a Nepali is difficult enough, sending a team might seem fanciful but that's a far more achievable aim than building a satellite from scratch.

2020-09-14 http://www.madeinepal.com/

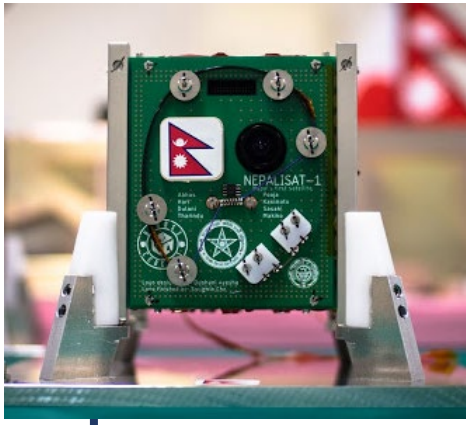
https://www.welcomenepal.com/

- **Cost: $100 is still high**
  Engineer's income is $300/month
- **Component availability**
  Since 2018, used CanSats out of components available in Nepal
- **Pandemic**
  adapting to COVID-19



Agenda

*Concept



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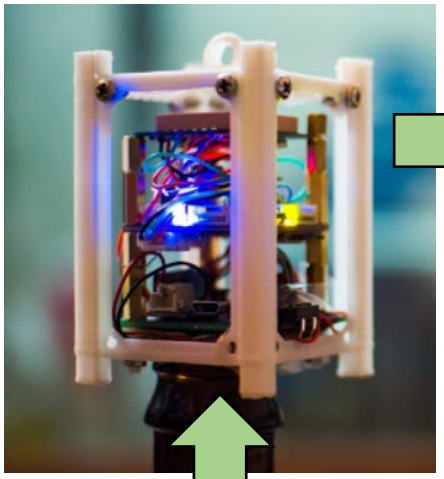
  What makes sense?
  How do we progress post-pandemic?

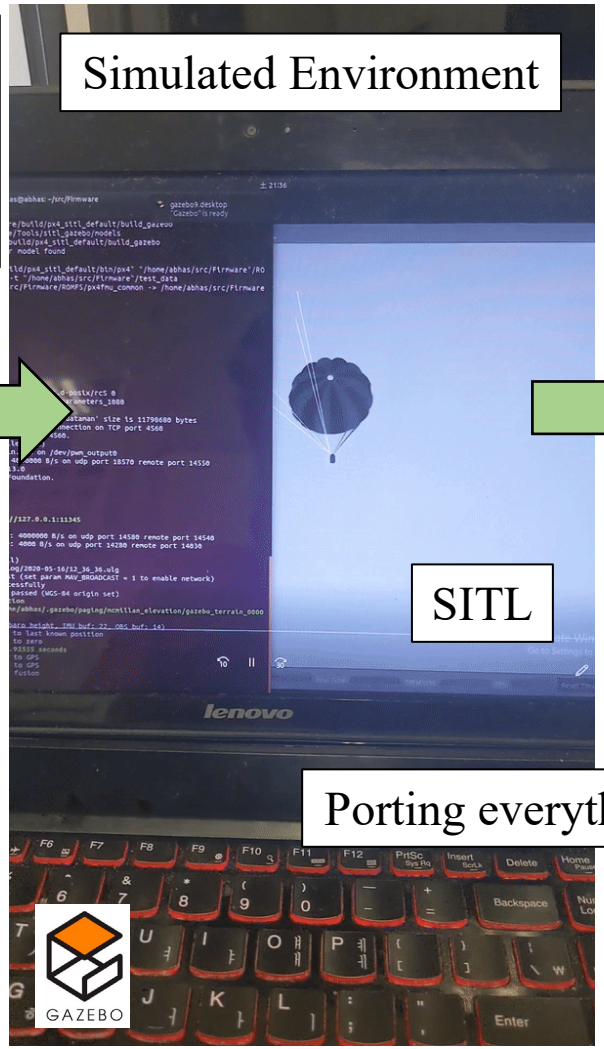
Responding to Pandemic

*Concept

Enormous Potential
Virtual CanSat Training?
Virtual CanSat Competition?
No Hardware Cost

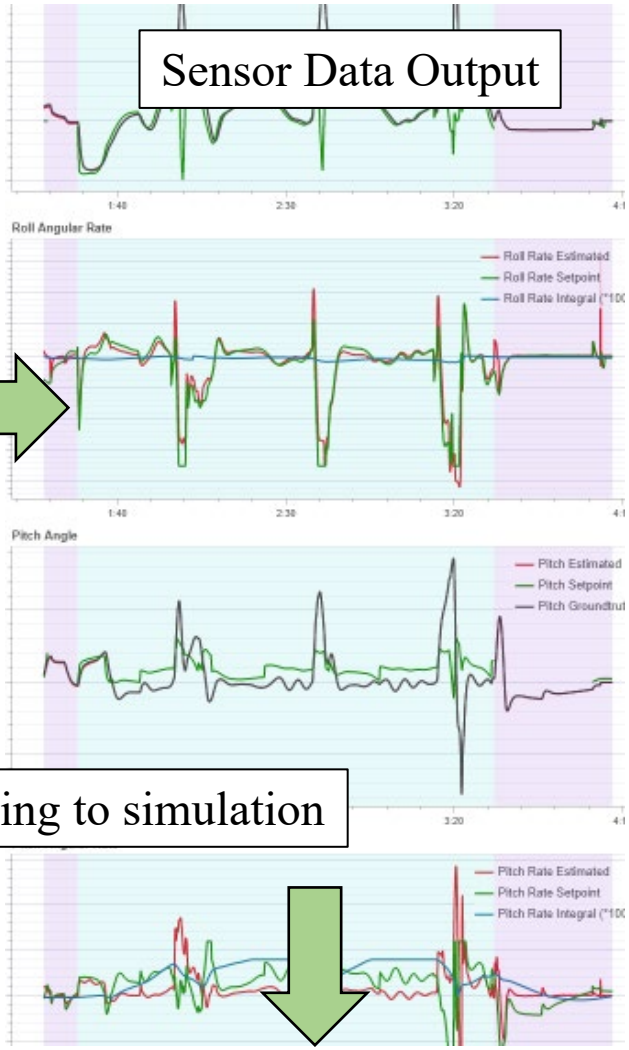


Simulated Environment



SITL

Sensor Data Output

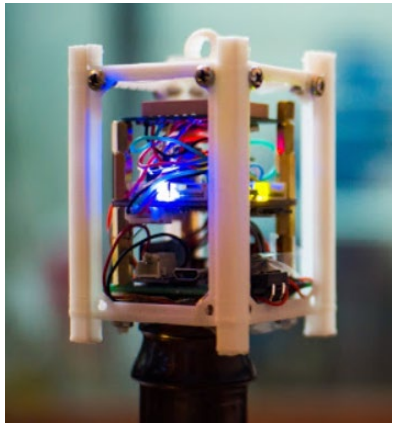


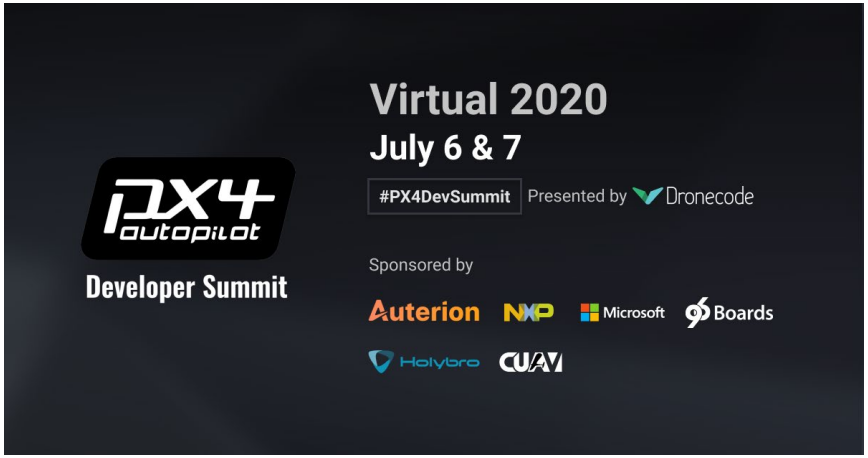
Porting everything to simulation

Do something with data

Leveraging Drone Infrastructure

*Concept





https://www.youtube.com/watch?v=aZS07EwNWAc

Education: Use of Open Data

*Concept

Machine Learning Models

*Concept

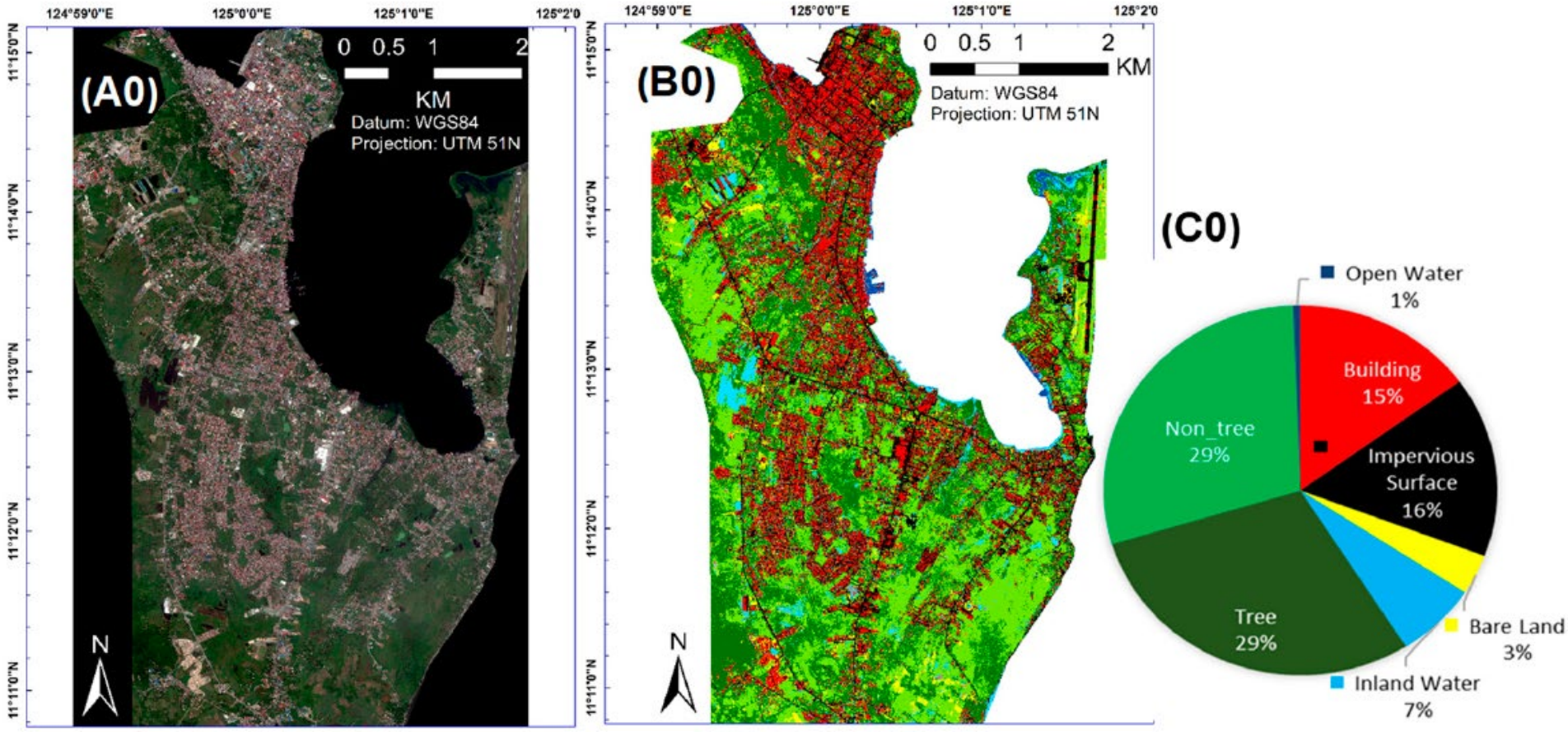


Image Classification and Segmentation using Support Vector Machine (SVM)

Sheykhmousa, M., Kerle, N., Kuffer, M. and Ghaffarian, S., **2019. Post-disaster recovery assessment with machine learning-derived land cover and land use information**. *Remote sensing*, *11*(10), p.1174.

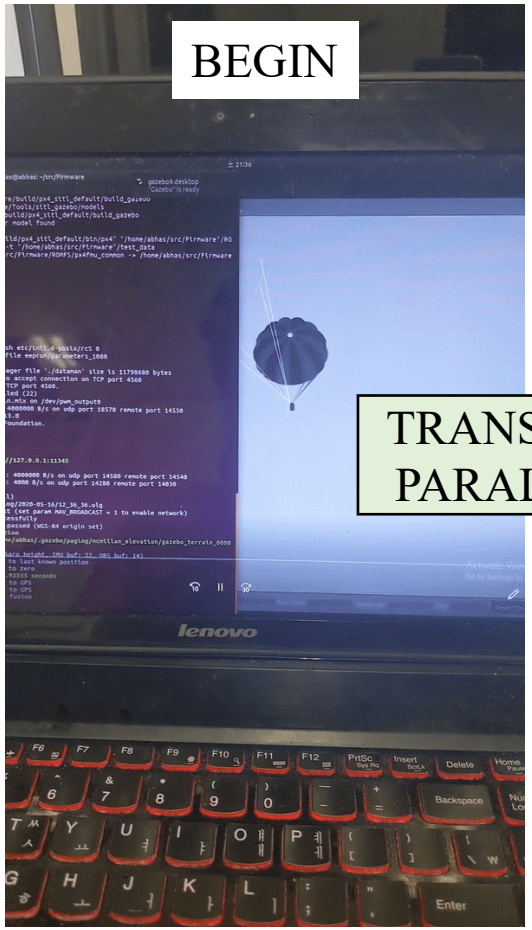
Summarize: Impact Plan

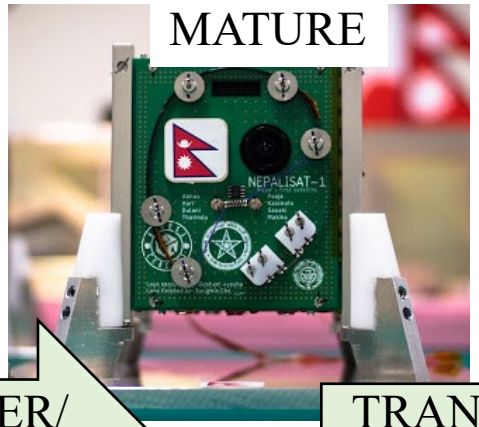
*Concept

Space Education by CanSats

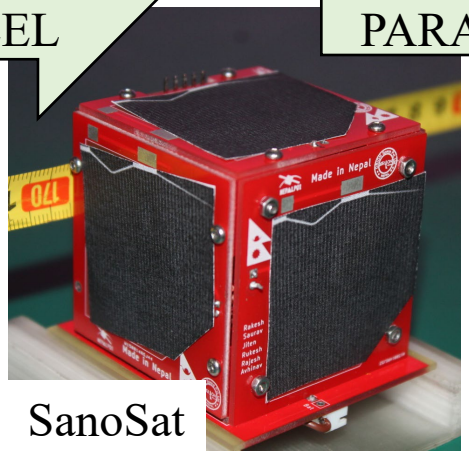
Space Systems Engineering by Pico/NanoSats

Satellite Data Science and Machine Learning



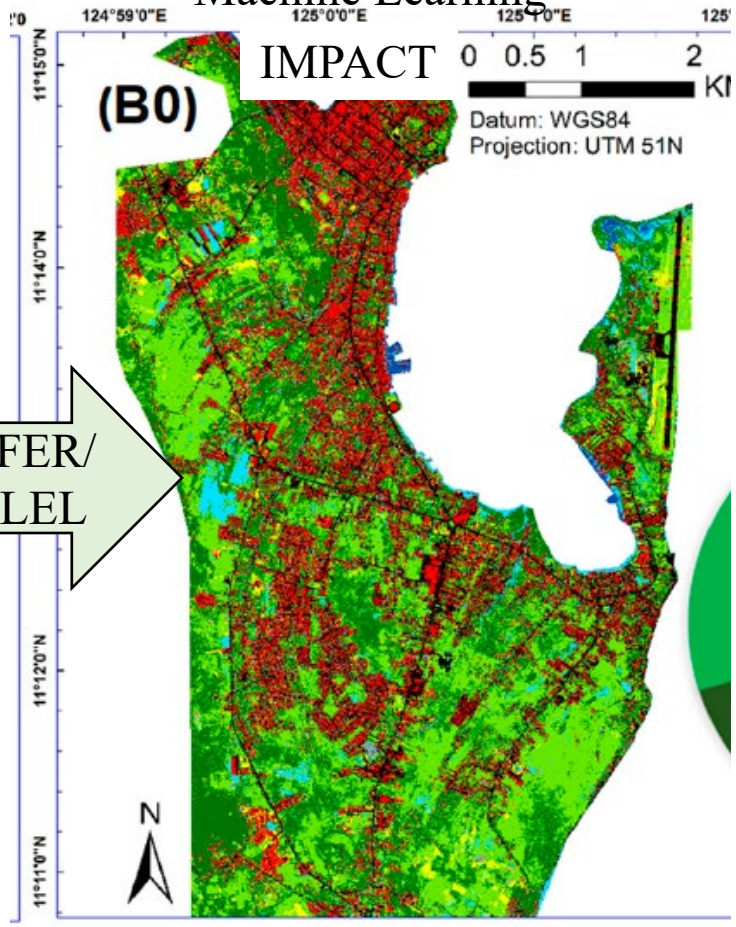


TRANSFER/ PARALLEL



SanoSat

TRANSFER/ PARALLEL



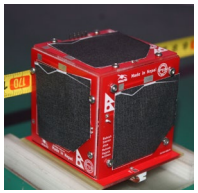
Solutions to Challenges

*Concept

	Work Around
Funding	Collaboration
Manufacturing Base	Collaboration
Component Availability	Collaboration
Dollar Outflow	Collaboration
Postal System (Logistics)	Collaboration
Mobility	Collaboration
Mass Exodus of Young People	Aim Younger
Public Schools are Sidelined	Involve Them
Bureaucratic Red Tape	Know People

UNISEC Next Gen. Leaders

*Concept



First Generation
PicoSat SanoSat
Orion Space Pvt. Ltd.

First CanSat Competition
Kathmandu Uni. 2019

Led Sasto Grassroot
2019, 2020

First Generation
Sasto Grassroot
2016, 2017

Co-organizers at
SastoSat Grassroot
Brihaspati 2018, 2019

Led SastoSat Grassroot
Brihaspati 2018

Annual Drone Training

UNISEC
University Space Engineering Consortium

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THANK YOU

http://www.madeinepal.com/

editor@madeinepal.com