

Credit: Statistics Canada



... a journey from *WesternU*  
to *CFHT* ♦

*Viraja Khatu, Ph.D.*

Credit:  
Visible Earth / NASA



NTCO AGM  
February 22, 2024

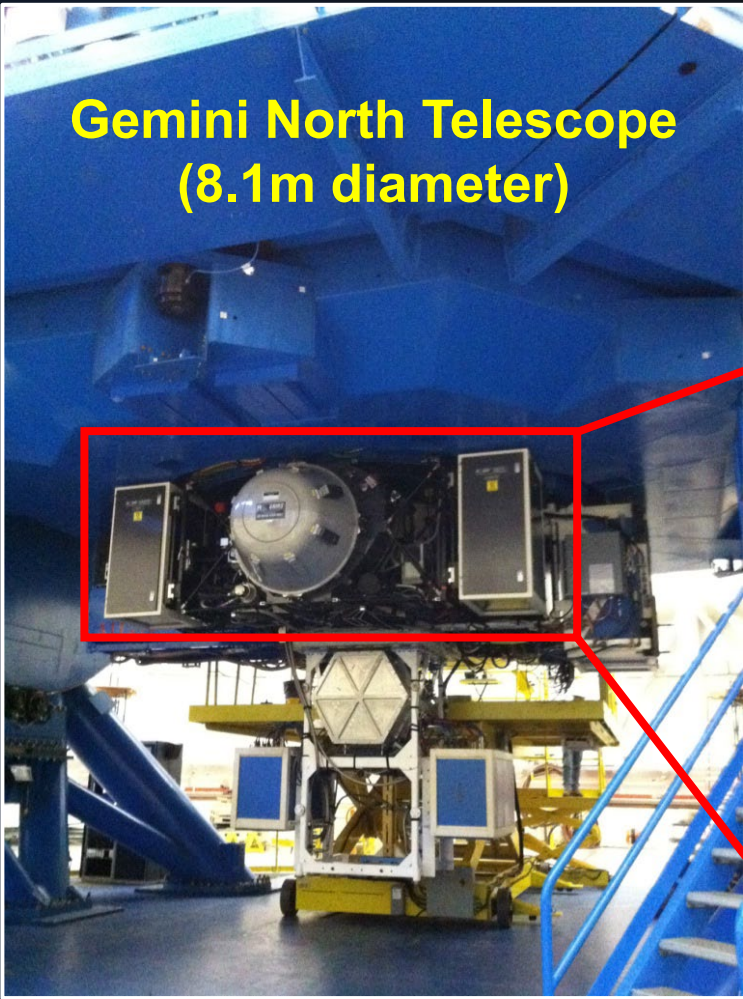
- The University of Western Ontario
- ♦ Canada-France-Hawai'i Telescope

# GNIRS mounted on the Gemini North Telescope

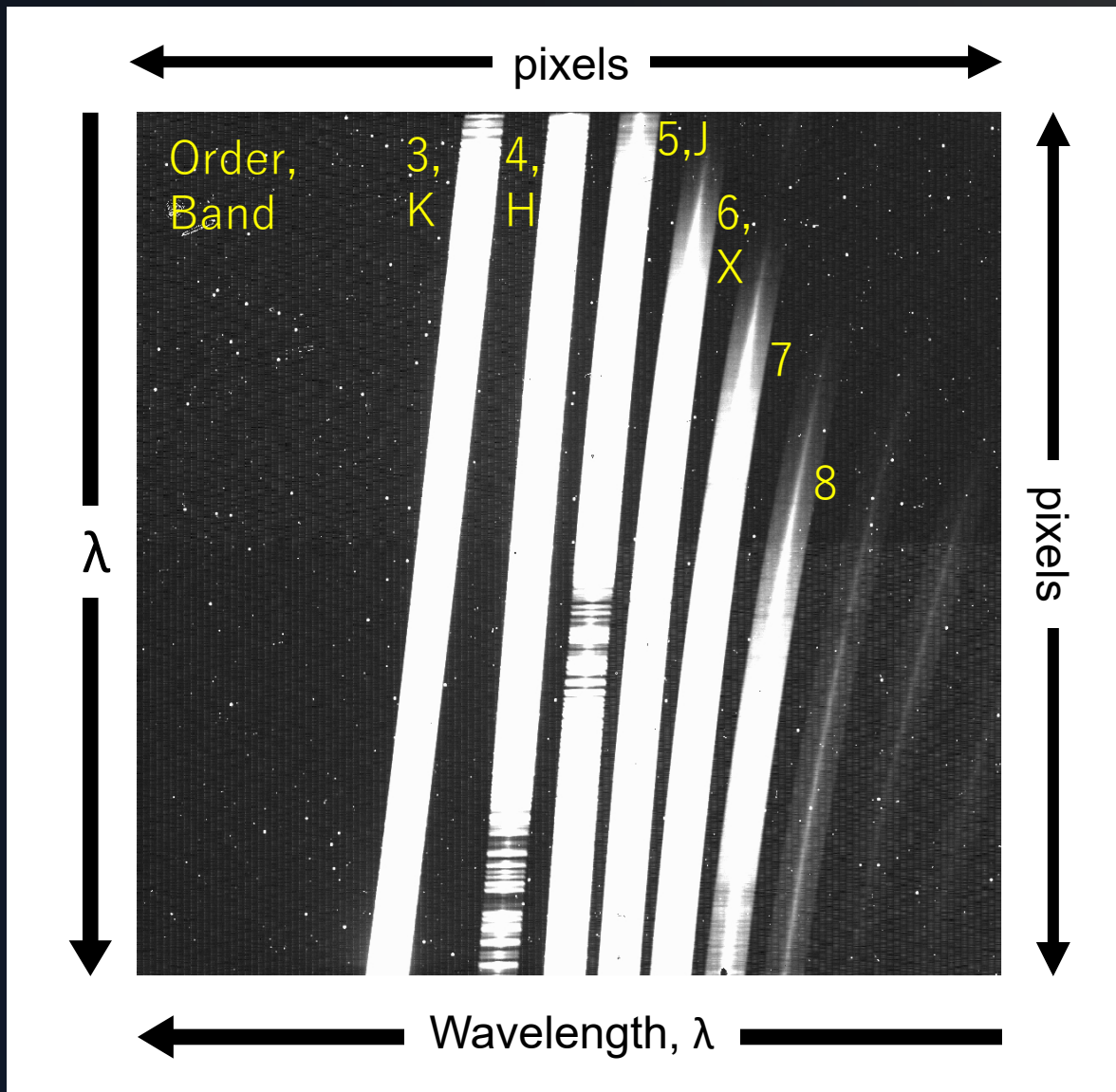
**Gemini North Telescope  
(8.1m diameter)**

\*Gemini Near-InfraRed Spectrograph

**GNIRS\***

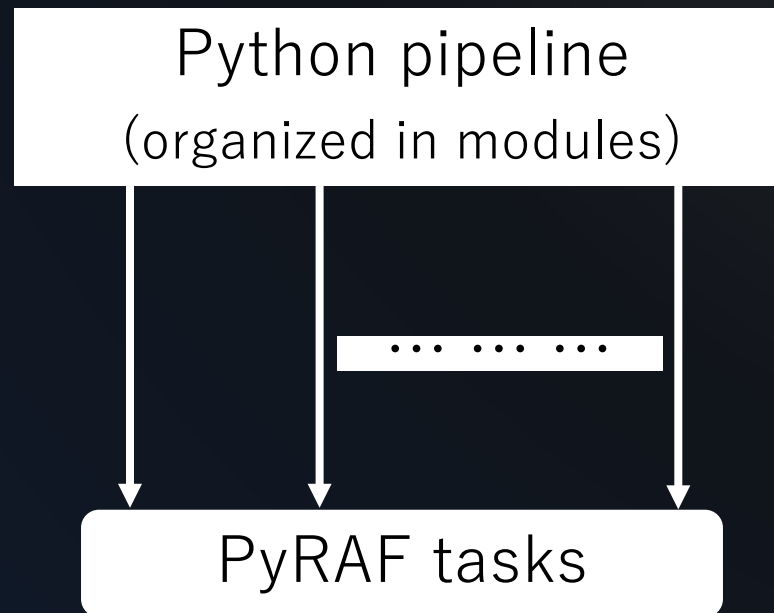


# Cross-dispersed spectrum of an Active Galactic Nucleus



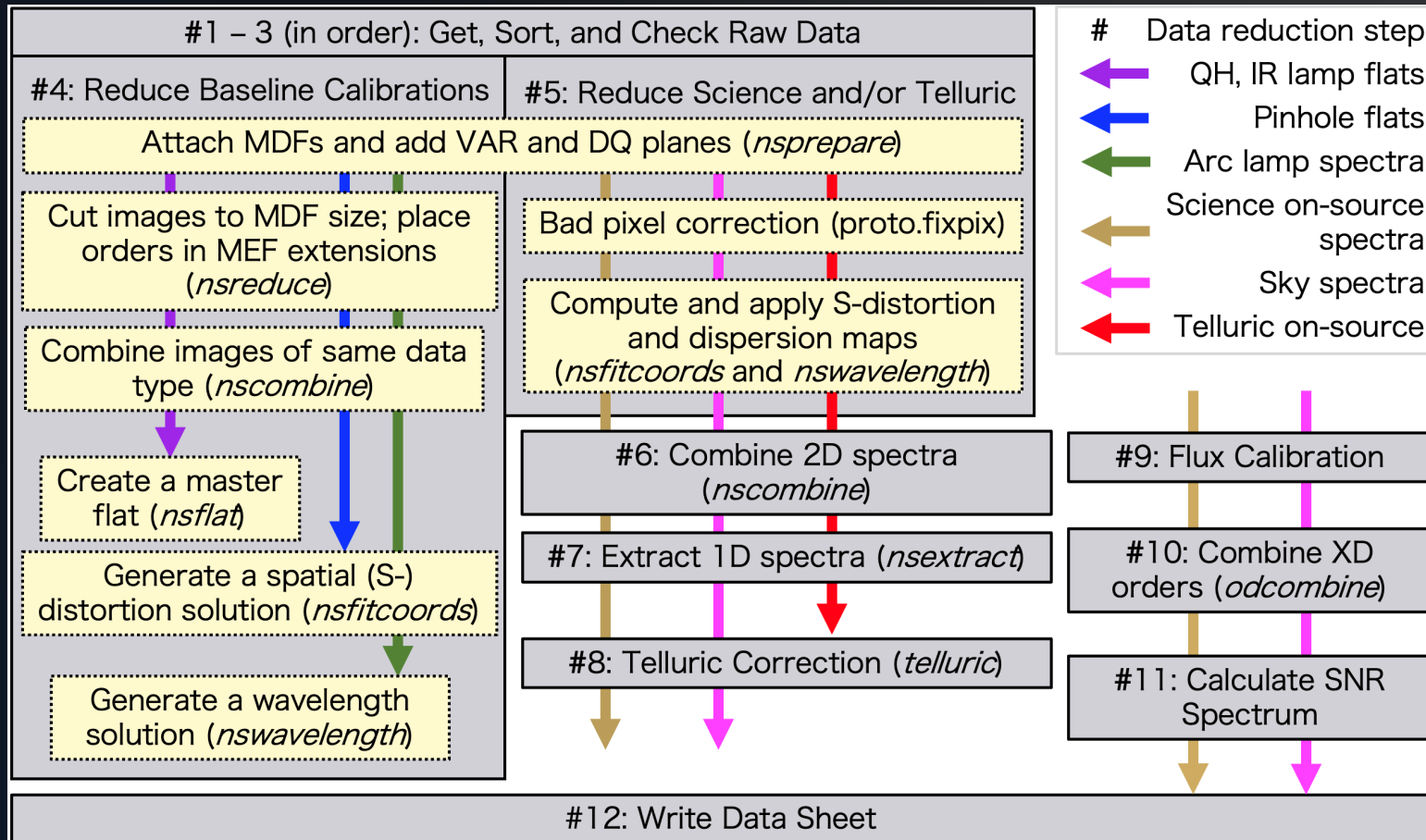
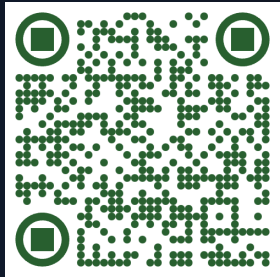
# GOAL

Design a *robust, user-friendly, easy-to-maintain* data-reduction pipeline for processing GNIRS cross-dispersed data.



# GNIRS-Pype: A 12-step program

GitHub  
code

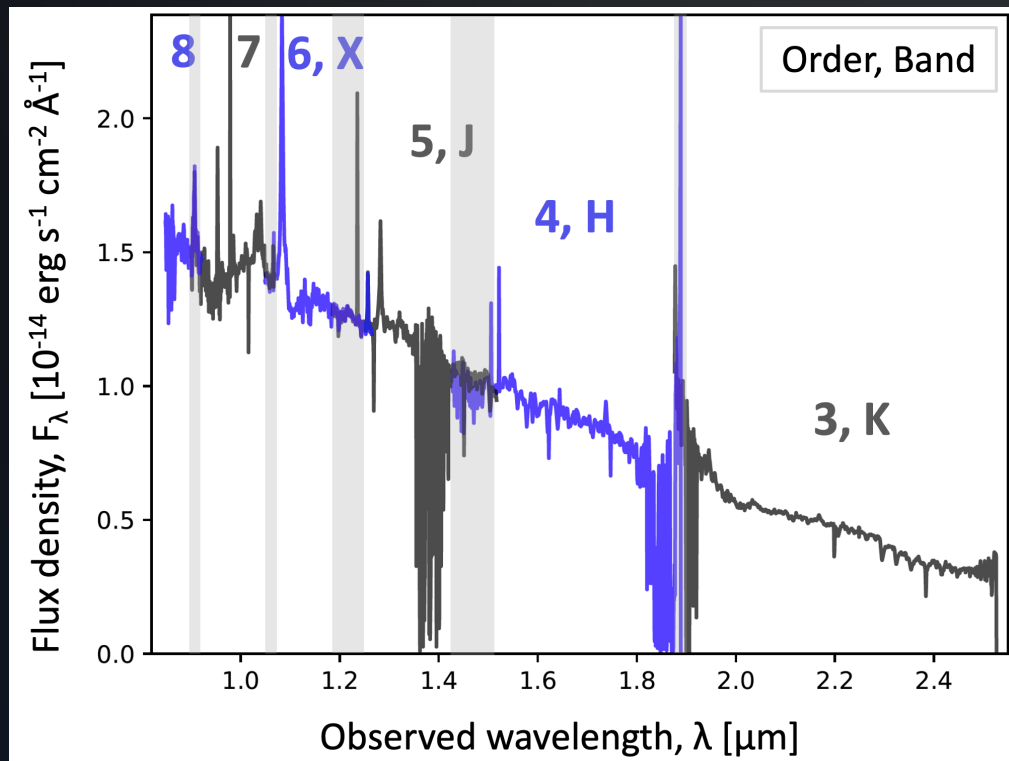
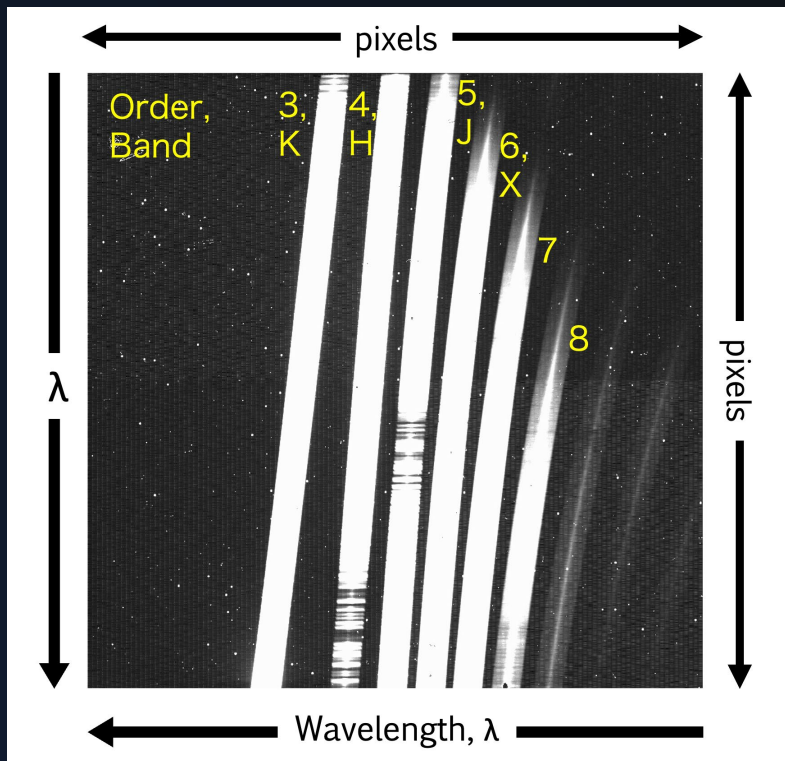


# GNIRS-Pype

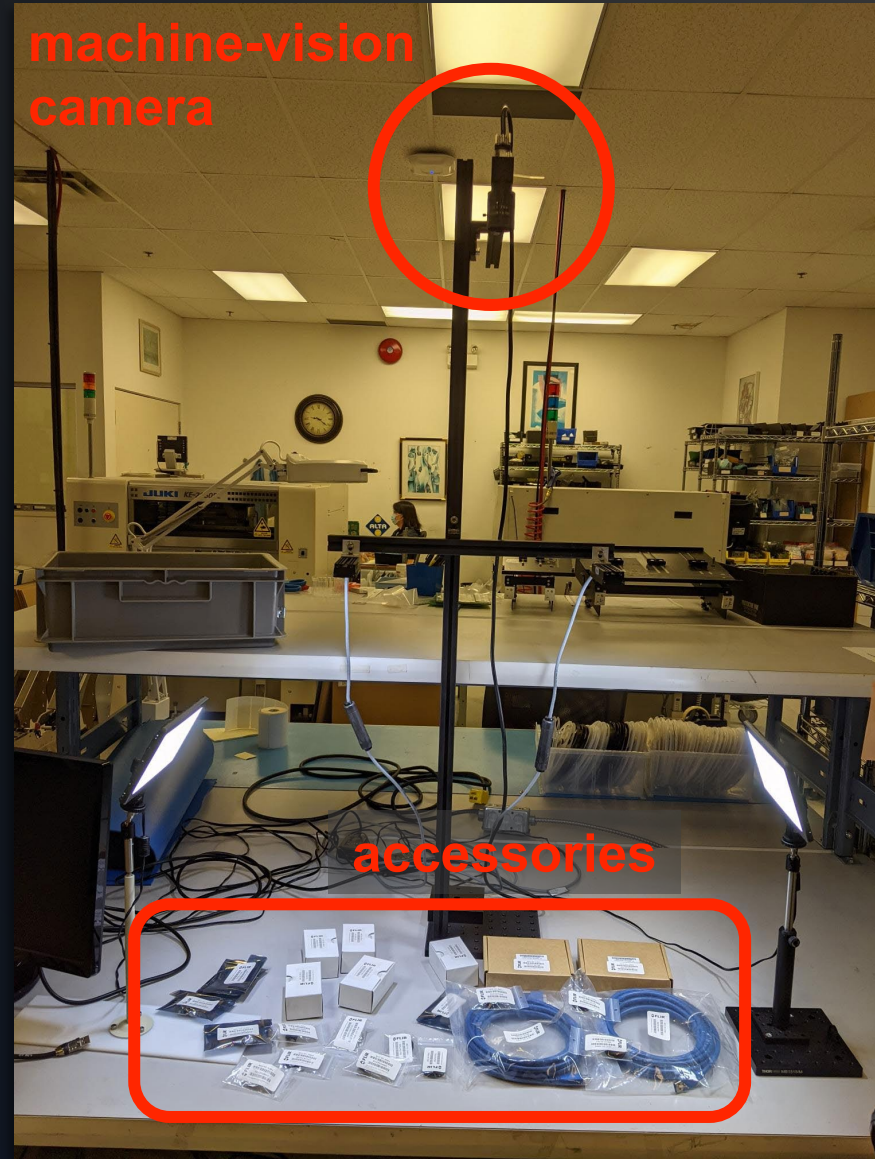
Raw image



1D spectrum



# Machine Vision Camera Setup in Shipping Department



Barcode

Part number

ACC-01-5012



B122032143

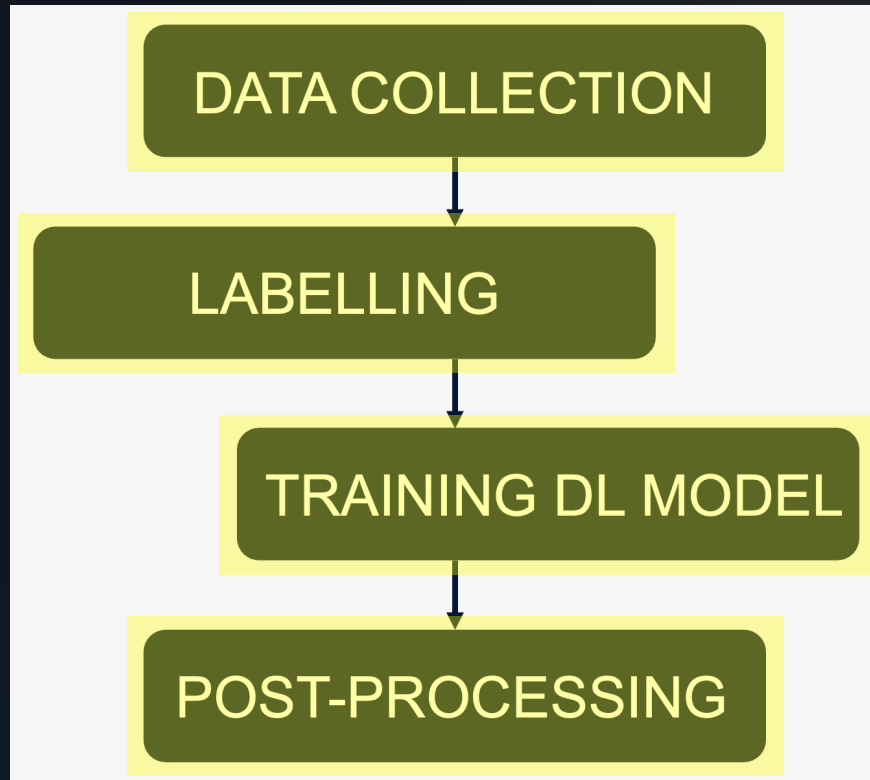
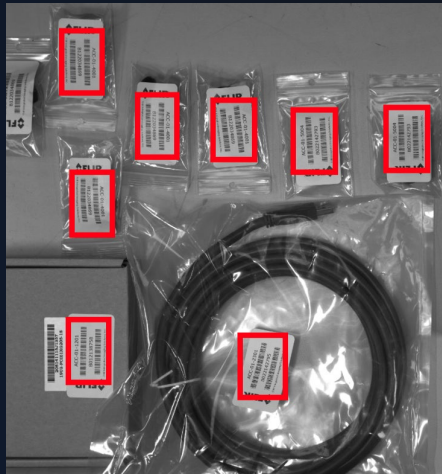


FLIR Integrated Imaging Solutions, Inc.

Batch number

# GOAL

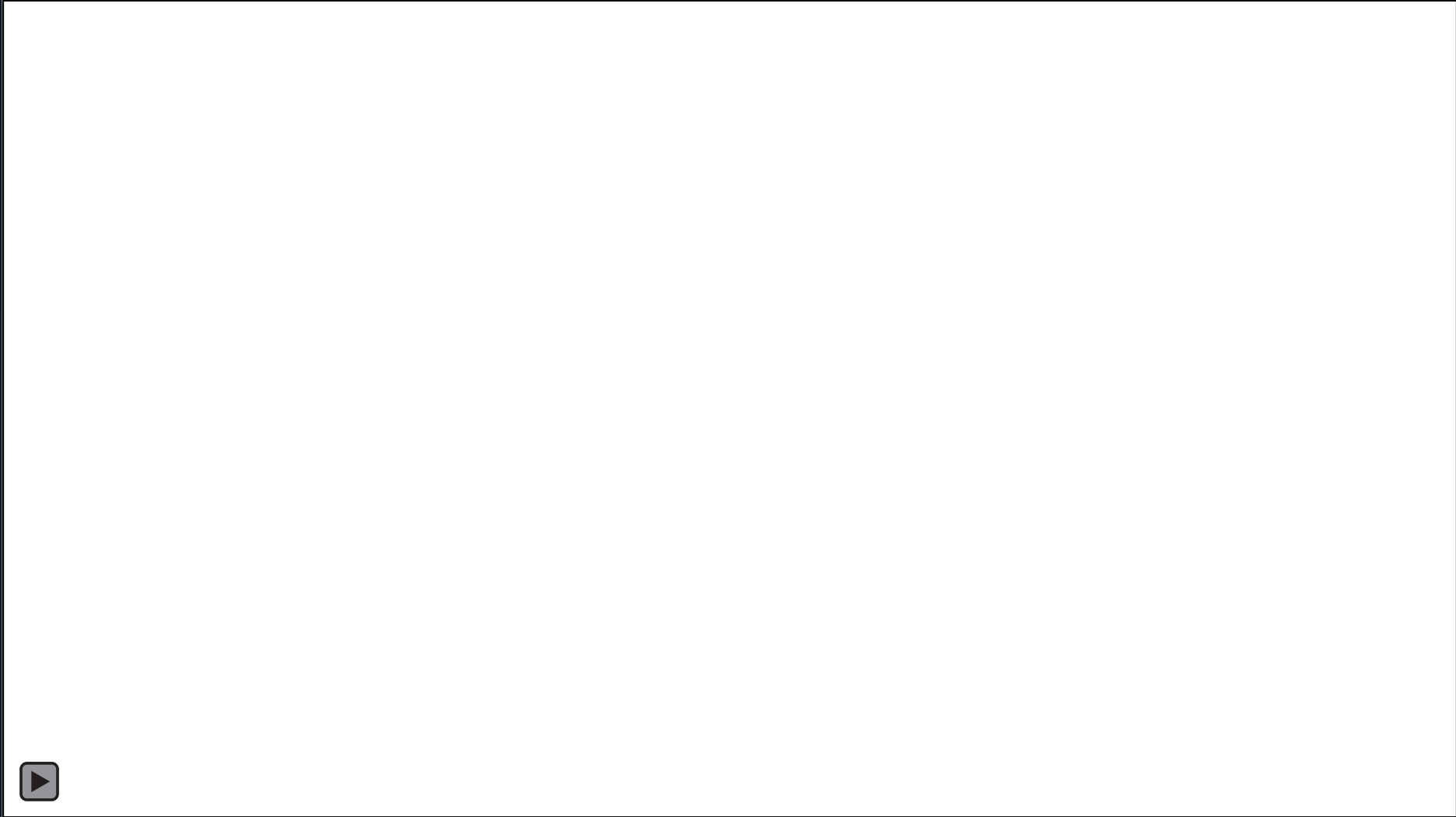
Design a *machine vision + deep learning* pipeline for decoding accessory bar codes and identifiers.



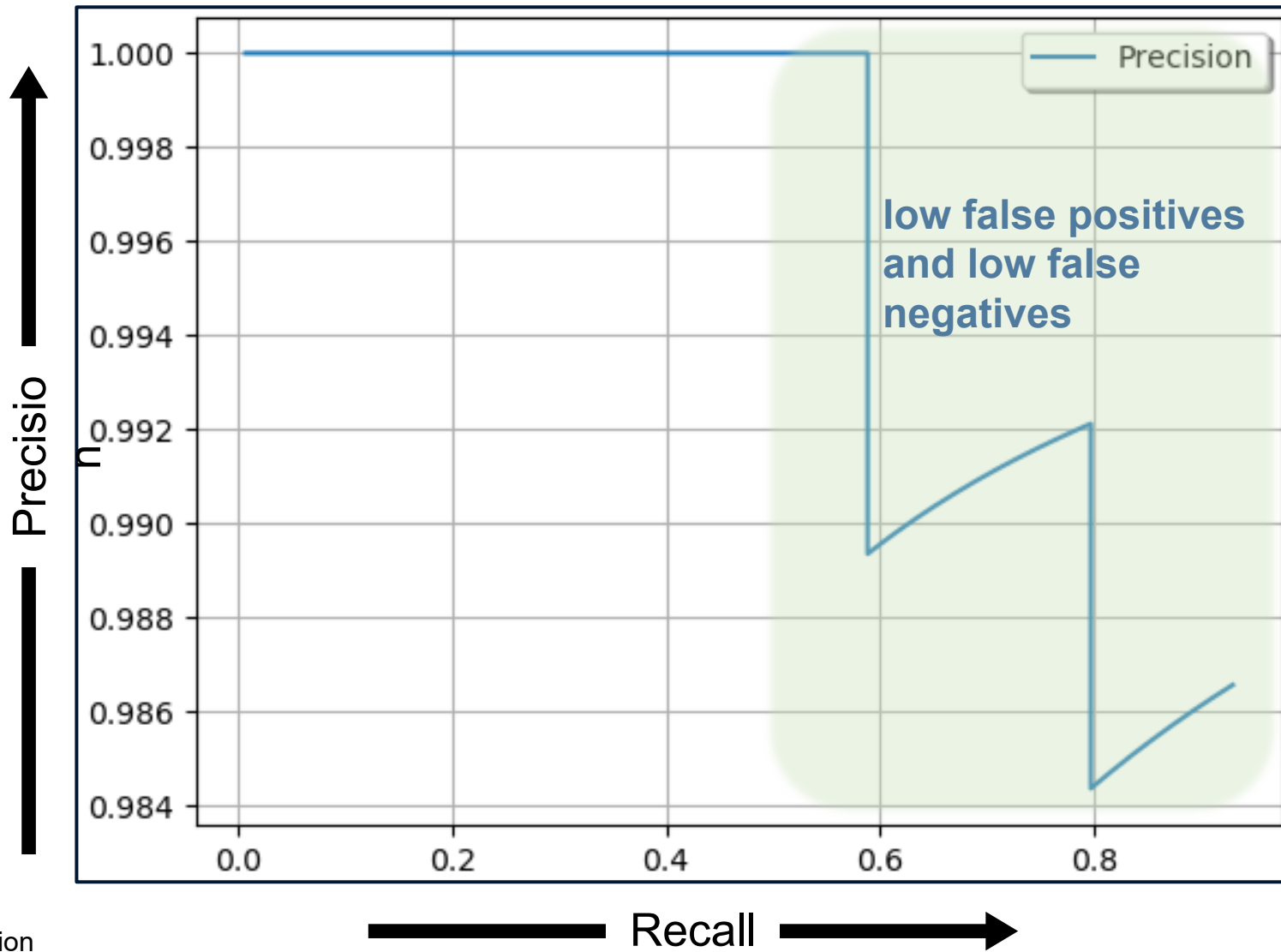
DL: Deep Learning



# Machine Vision + Deep Learning Pipeline in *action* !



# Evaluation: Precision vs. Recall Curve



AP:  
Average Precision

mAP:  
mean of Average Precision

# My Key Take-aways

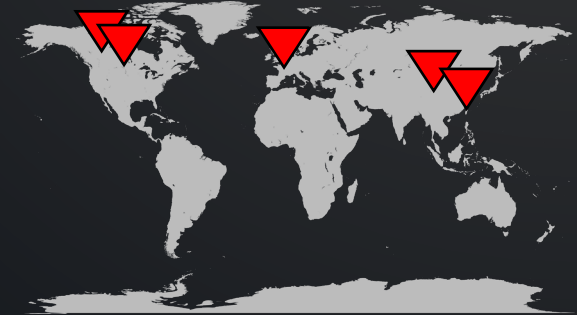
- ✓ Developing pipelines in a methodical way
- ✓ Detailed study of an instrument for taking astronomical data (GNIRS)
- ✓ Planning my goals and objectives...
  - ✓ Independently (Gemini)
  - ✓ As a team (FLIR)
- ✓ **Achieving deliverables in short turnaround times (Gemini and FLIR)**

# A Brief Introduction to CFHT



3.6m telescope on the Maunakea Summit  
(~13000 feet above sea level)

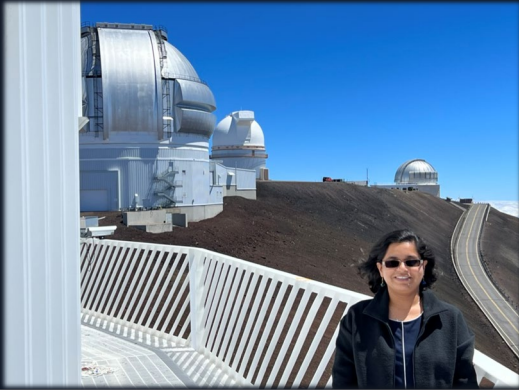
User community:  
US, Canada, France, China, and Taiwan



Staff: ~40 people → astronomers, remote observers, engineers, software developers, technicians, and human resources

Operations: Headquarters (Waimea) + Observatory

# As a Canadian Resident Astronomer...



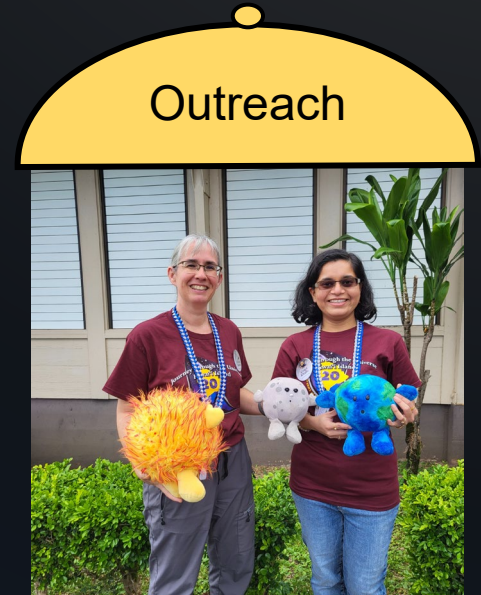
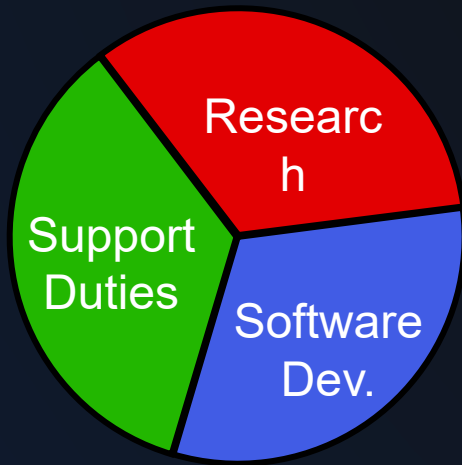
Summit Tour, Interview



First Day, My Office



Welcome Coffee,  
CFHT



Credit: Statistics Canada

# Acknowledgements

Andrew Stephens (Gemini)

Marie Lemoine-Busserolle (former Gemini)

Ahmed Sigiuk (former FLIR)

Stephen Se (FLIR)

Sarah Gallagher (Western U)

Kim Venn (U of Victoria)

Jeremy Riishede (former NTCO)

Margaret Gwyn (former NTCO)



Credit:  
Visible Earth / NASA



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