



ETH AI CENTER



AI ETHZ & Swiss Space Center – collaboration proposal



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Project Goals – IGLUNA + AI (Digital Twin Earth)



- ML and AI are widely used in Earth Observation data processing for **super resolution** and **pattern recognition**.
- But a lot needs to be done to fuse different data sources and create a real time **Digital Twin** to monitor Earth:

->Data Fusion



Digital Twin Earth

- Digital Twin Earth – a dynamic, digital replica of our planet which accurately mimics Earth's behaviour.
- Fed with **Earth observation data**, combined with in situ measurements and **artificial intelligence**.
- Digital Twin Earth provides an accurate representation of the **past, present and future** changes of our world.
- Endless opportunities for commercial applications: insurances, agri-food, commodity sourcing



Artificial intelligence for Space Applications

Several AI space applications:

Guidance Navigation and control (upstream): [Link](#)

- Autonomous trajectory correction
- Formation flying
- Collision avoidance
- Celestial body landing
- Space Debris monitoring

Earth Observation (downstream): [Link](#)

- Climate change monitoring
- Natural disasters mitigation
- Tracking of scarce natural resources

[AI white paper](#)



Public Funding

For Academia:

- **European Space Agency (ESA) FUTURE EO-1 EO SCIENCE FOR SOCIETY:** [Link](#)
150k EUR grant - deadline – mid March 2021
- **ESA OSIP platform:** [Link](#)
Co-funding for PhD – 90kEUR
- **Horizon 2020 & Horizon Europe Green Deal:** [Link](#)

For Startups:

- **ESA business incubator:** [Link](#)
200k EUR in non dilutive seed funding
- **ESA Incubed accelerator:** [Link](#)
Non dilutive co-funding (not in CH)
- **Climate KIC:** [Link](#)
Seed rounds

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How do we get there ?

1. Short term strategy (one academic semester)

- Create a 6 months hackathon on real time Data Fusion
 - EU Sentinel & NASA Landsat Earth Observation data
 - Eumetsat Meteosat Meteo data
 - Ground segment humidity, temperature, seismic data
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2. Long term strategy (min.3 years)

- Creation of a real time Digital Twin Earth to monitor and predict natural disasters and climate change
- Direct collaboration with ESA, CERN, EPFL, AI ETHZ, Swiss Space Center and industrial actors (Swiss Re, ...)





Major milestones in the 6 months competition:

Use the model of ESA Advanced Concept team <https://kelvins.esa.int> competitions

- **Duration (6 months)**
 1. Month 1: Data collection released & call for submissions.
 2. Month 2: Release of the challenge – predicting a few features in time at preset locations.
 3. Month 3: Meet up event with exchanging ideas and strategies and technical tips for image processing.
 4. Month 4: Mid-term submission and review by a board of experts (ESA, AI ETH, EPFL, CERN, Climate KIC)
 5. Month 5: Final submission of the code and evaluation of the winner
 6. Month 6: Winning team is publishing the code (open source GitHub repository) together with a scientific paper

Long term strategy – Digital Twin Earth



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UZH
Space Hub

Goal: Bring together academia, industry, research institutions, Cantons and Federal Enterprises to work on the **Digital Twin Earth topic**

Duration: 3 years +

Main actors:

SSC, Space4Impact, ETHZ AI, EPFL, CERN, ESA, industry – Picterra, University of Zurich – Remote Sensing Group, Swiss Re



ETH zürich

EPFL

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Roadmap



Today

Sep 2021

Mar 2022

Sep 2022

Sep 2025

Ressources available

- EO Images
- Meteo data
- Cloud storage

Generate knowledge base

- Challenge on
 - EO Images
 - Clean data
 - AI for efficient processing

Generate knowledge base

- Conclude challenge
- Gather learnings

Initiate collaboration

- ESA, CERN, EPFL, industrial partners
- Exploit funding opportunities

Launch **collaborative development project** on digital twin earth

Validated **model** for digital twin earth

Benefits



Combine expertise for hosting challenge

- SSC: organisation
- AI Center ETH: technical



Platform for students to **apply knowledge**



Ideal framework for **start-up initiation**



Push research using cutting-edge analytical & data fusion techniques



Outreach by connecting with ESA and industry



Streamlined **application for grants**

