Deep Learning & Earth Observation
Artificial Intelligence & Machine Learning Lab [AI:ML]

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Space 4.0

Industry 1.0: use of water- and steam power
Industry 2.0: mass production through production belts and electric energy
Industry 3.0: use of electronics for automation
Industry 4.0: collective term for technologies and concepts of value chain organization:
- internet of things (machine-machine-interaction)
- internet of services
- vision of the smart factory

Space 1.0: astronomy (+astrology)
Space 2.0: race in space, Apollo era
Space 3.0: space as next dimension, ISS era
Space 4.0: New Space, relaxed, fascinating, comprehensive...
  → interaction with society
  → increasing number of space faring nations
  → commercialisation
  → spin off, spin in
  → public, private, tourism
  → new roles (industry, agencies, EC)
Data experts gather to find solutions to world’s biggest challenges at UN Forum

What good is AI for UN Development Goals?

The United Nations may have a reputation for being a talking shop. But when it comes to artificial intelligence and the 2030 Sustainable Development Goals, it’s trying to get ahead of the conversation.
UN Sustainable Development Goals & Earth Observation

[Image showing the 17 Global Goals]

1. No Poverty
2. Zero Hunger
3. Good Health
4. Quality Education
5. Gender Equality
6. Clean Water and Sanitation
7. Affordable and Clean Energy
8. Good Health and Well-being
9. Industry, Innovation and Infrastructure
10. Reduced Inequalities
11. Sustainable Cities and Communities
12. Responsible Consumption and Production
13. Climate Action
14. Life Below Water
15. Life on Land
16. Peace and Justice
17. Partnerships for the Goals
UN Sustainable Development Goals & Earth Observation
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- Poverty Indices
- Agriculture
- Pollution Monitoring (Oil Spills, Smok, Pipelines)
- Water Utilization
- Crop Estimate
- Infrastructure & Traffic Monitoring
UN Sustainable Development Goals & Earth Observation

- **No Poverty**
- **No Hunger**
- **Good Health**
- **Quality Education**
- **Gender Equality**
- **Clean Water and Sanitation**
- **Renewable Energy**
- **Good Jobs and Economic Growth**
- **Innovation and Infrastructure**
- **Reduced Inequalities**
- **Sustainable Cities and Communities**
- **Responsible Consumption**

- **Poverty Indices**
- **Agriculture**
- **Pollution Monitoring** (Oil Spills, Smog, Pipelines)
- **Water Utilization**
- **Crop Estimate**
- **Ice Caps**
- **Carbon Stocks**
- **Climate Change**
- **Alge-Bloom**
- **Natural & Manmade Disasters**
- **Wildlife Monitoring**
- **Deforestation**
- **Infrastructure & Traffic Monitoring**
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MediaEval Benchmark: Multimedia Satellite Task

2017 Challenge

2018 Challenge
MediaEval Benchmark: Multimedia Satellite Task

2017 Challenge

Tasks:
- Disaster Image Retrieval from Social Media
- Flood Detection in Satellite Imagery

Participation:
- 11 teams registered
- More than 60 submissions (both sub-tasks)
- Community Building Workshop in Dublin, Ireland

Approaches: Deep Neural Networks (CNN & SegNet)

2018 Challenge
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  - Classification for Road Passability (Yes [level of access] vs No)
  - Flood Detection in Satellite Imagery

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### 2017 Challenge

**Input:** Satellite Images  
**Output:** Segmentation masks

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Remote Sensing & Satellite Image Analysis

- Land-Use and Land-Cover Classification (Patch based)
- DeepEye for Natural Disasters
- Multimedia Satellite Task 2017/2018
- Estimation of (Micro)-Economic Factors
- Land Use and Land-Cover Segmentation
- Missing Data during Inference
- Multimodal Fusion of Satellite Data
- Multi-Task Learning for Sem. Segmentation

Lead: Benjamin Bischke & Patrick Helber
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Prof. Dr. Damian Borth – Artificial Intelligence & Machine Learning [AI:ML] Lab