NASA INTERNATIONAL SPACE APPS CHALLENGE

GeoAI Reimagined: Transformative and Diverse Earth Science Applications Using Foundation Models

FLOOD WATCH

Team: Bingus e Amigos
NASA Space Apps Challenge – Caxias do Sul (Brazil)

Flood occurred in Rio Grande do Sul (Brazil) September 2023

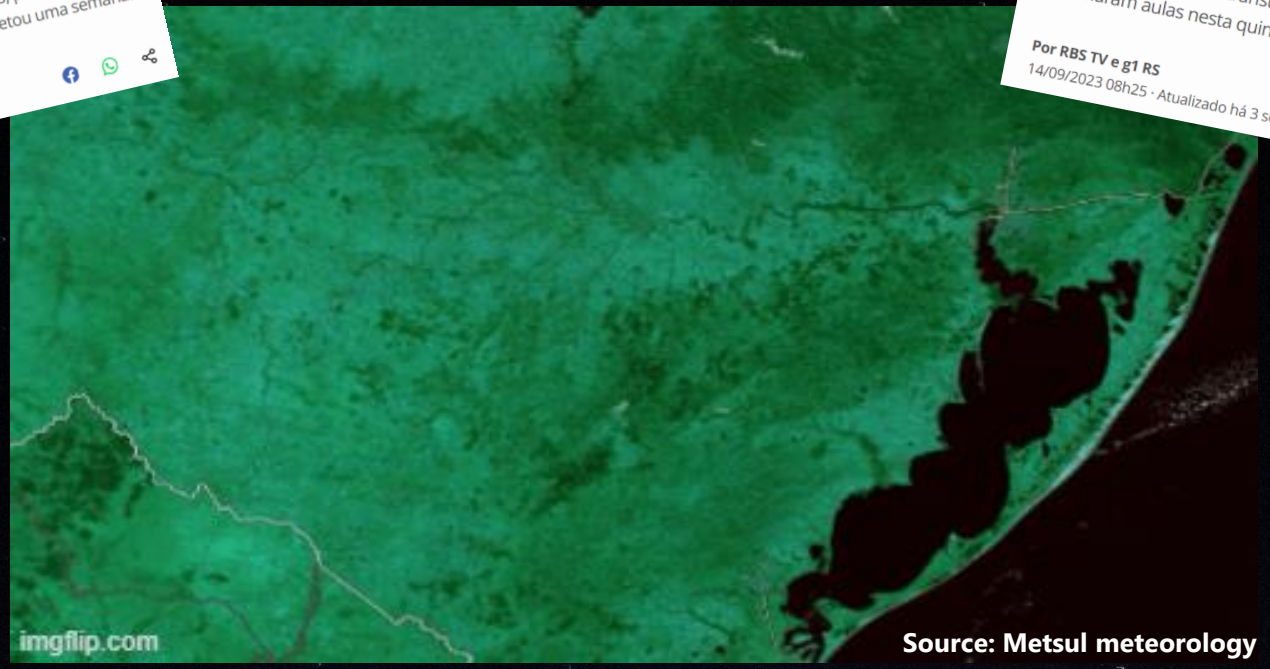
RIO GRANDE DO SUL

Cheia que causou enchente no RS poderia ter sido prevista 'com quase 24 horas de antecedência', afirmam professores da UFRGS

Nove docentes do Instituto de Pesquisas Hidráulicas (IPH) assinam o documento, publicado pela instituição na segunda-feira (11), quando a passagem do ciclone pelo RS completou uma semana.

Por g1 RS
12/09/2023 16h18 · Atualizado há 3 semanas

Flood that caused flooding in RS (State in southern Brazil) could have been predicted almost 24 hours in advance, say UFRGS (Local university) professors.



Source: Metsul meteorology

RIO GRANDE DO SUL

Após chuva, água invade casas em Porto Alegre e moradores precisam ser resgatados de bote; VÍDEO

Chuva vem causando transtorno e alagamentos em cidades do RS desde terça-feira (12). Municípios cancelaram aulas nesta quinta (14).

Por RBS TV e g1 RS
14/09/2023 08h25 · Atualizado há 3 semanas

After the rain, water invades houses in Porto Alegre and residents need to be rescued by boat.

Rio Grande do Sul pode ter alto volume de chuva nos próximos dias

Até agora, 46 pessoas morreram em decorrência do ciclone extratropical

Publicado em 11/09/2023 - 13:21 Por Pedro Peduzzi - Repórter da Agência Brasil - Brasília

Rio Grande do Sul (RS) may experience a high volume of rain in the coming days.

Informação sobre Alertas de Defesa Civil

Casa Militar

Voltar

Utiliza o CEP como referência de localização

Acessar o serviço

Descrição

Informação prestada sobre Alertas de Defesa Civil. Embasada em diversos centros e institutos de meteorologia, a Defesa Civil do Rio Grande do Sul recebe e emite avisos e alertas em caso de previsão de eventos climatológicos ou desastres naturais.

Informations about Civil Defense alerts (Uses ZIP code as a location reference).

FLOOD WATCH

Prototype of an AI model under development aiming to analyze satellite images associated with rainfall records in order to, given a rainfall forecast for the specified region, predict the geographical positions nearby water bodies will reach.

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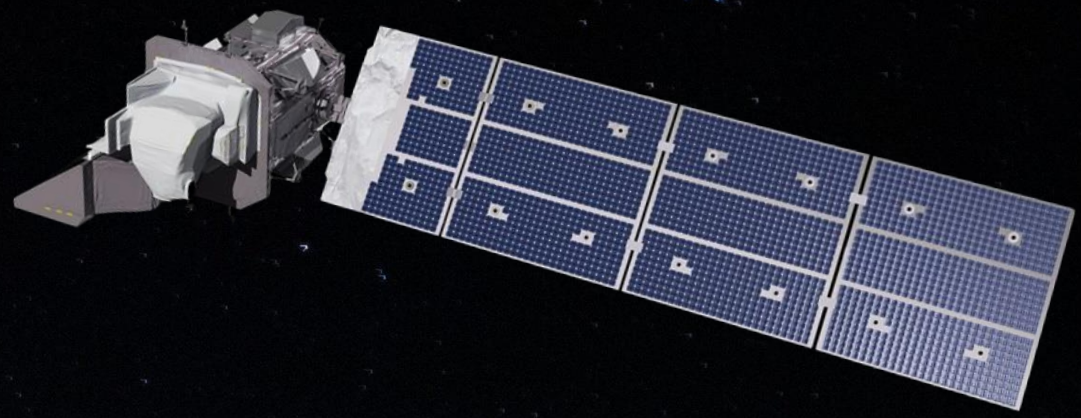
General Câmara (RS) September 24, 2023

Source: Planet SCCON

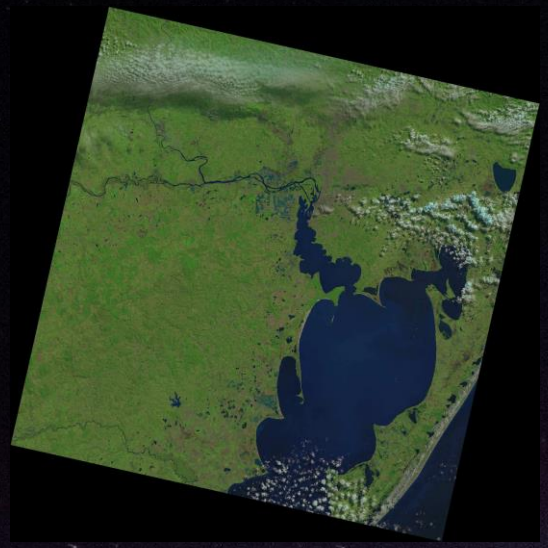
CURRENT SYSTEM DEVELOPMENT STATE

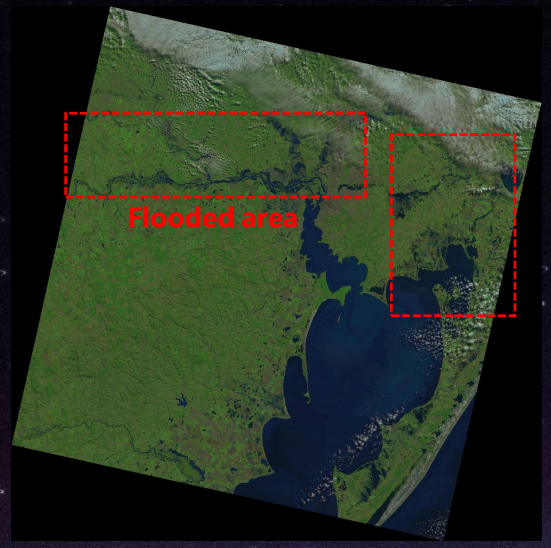


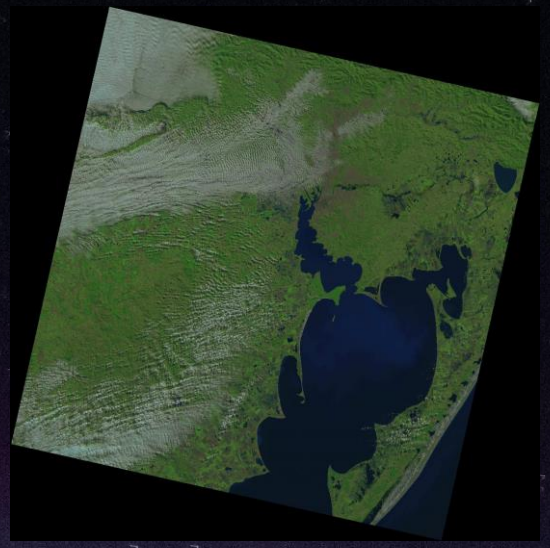
Landsat 9

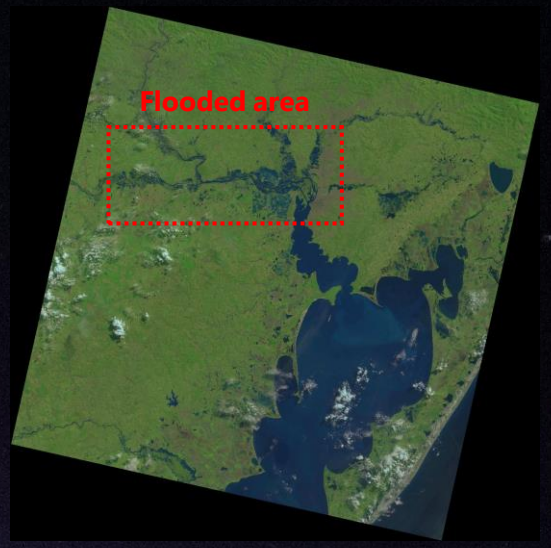
Convolutional neural network model for analysis and classification of territorial images with a focus on water bodies in the State of Rio Grande do Sul.

TIFF: High-quality Raster file generated by satellites





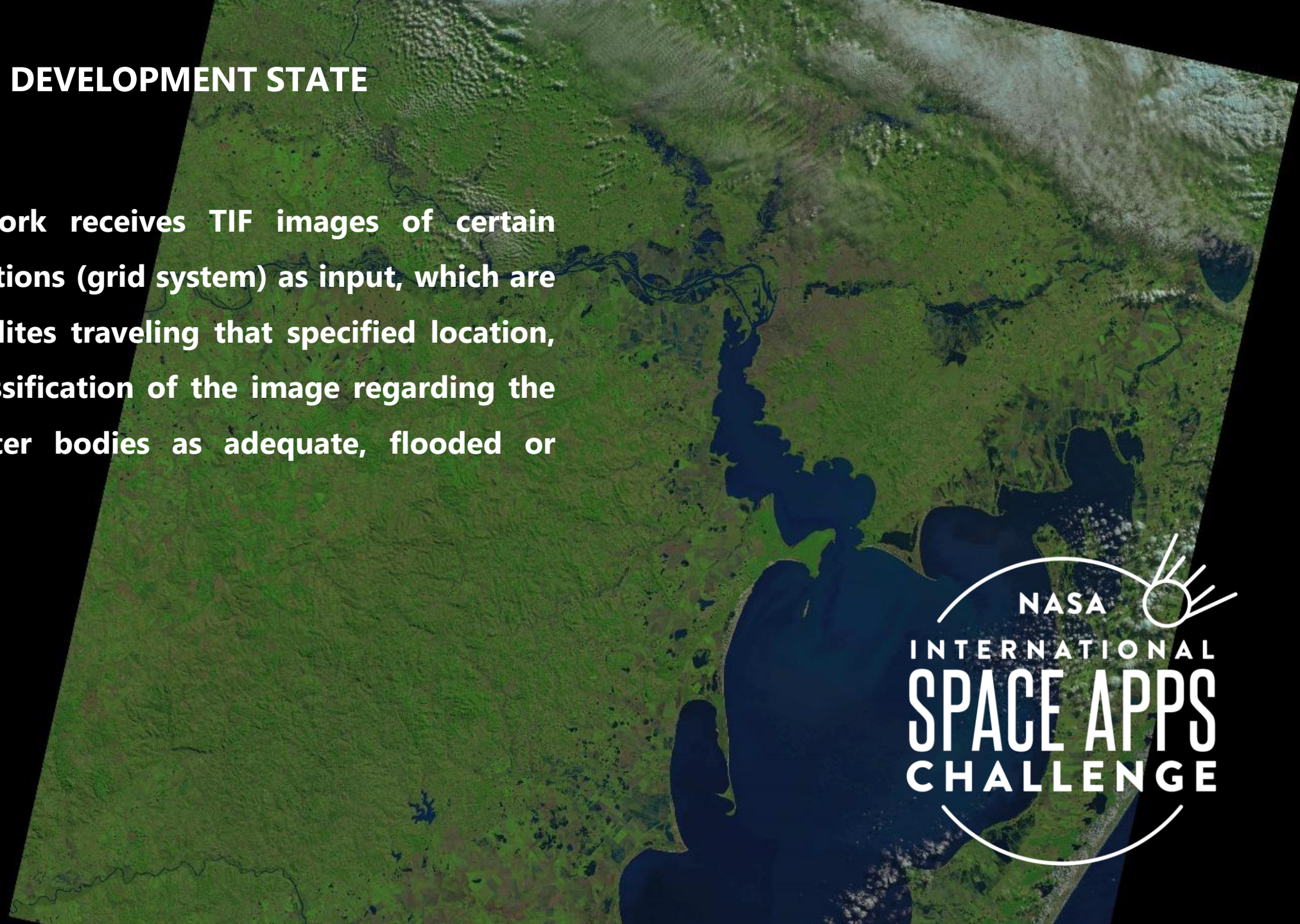




Source: NASA Earth Explorer

CURRENT SYSTEM DEVELOPMENT STATE

The neural network receives TIF images of certain geographical locations (grid system) as input, which are provided by satellites traveling that specified location, and returns a classification of the image regarding the state of the water bodies as adequate, flooded or inconclusive.



Source: NASA Earth Explorer

CURRENT SYSTEM DEVELOPMENT STATE

Currently, due to low data volume, the model converges to class 0 at its actual state.

0 = adequate

1 = flooded

2 = no-data (inconclusive)

```
Actual Model -> label: [0, 0], predicted: [0, 0]
Loaded Model -> label: [0, 0], predicted: [0, 0]
tensor([[ 1.5797,  0.2974, -0.3713],
        [ 1.5635,  0.2940, -0.3707]], device='cuda:0')
Actual Model -> label: [0, 1], predicted: [0, 0]
Loaded Model -> label: [0, 1], predicted: [0, 0]
tensor([[ 1.4128,  0.2570, -0.3522],
        [ 1.4297,  0.2593, -0.3481]], device='cuda:0')
Actual Model -> label: [1, 1], predicted: [0, 0]
Loaded Model -> label: [1, 1], predicted: [0, 0]
tensor([[ 1.6152,  0.3073, -0.3780],
        [ 1.5425,  0.2884, -0.3615]], device='cuda:0')
Actual Model -> label: [1, 2], predicted: [0, 0]
Loaded Model -> label: [1, 2], predicted: [0, 0]
tensor([[ 1.0848,  0.1591, -0.2780]], device='cuda:0')
Actual Model -> label: [2], predicted: [0]
Loaded Model -> label: [2], predicted: [0]
Accuracy of the model: 68.42105263157895 %
```

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NEXT STEPS

- Research and selection of the appropriate meteorological data source;
- Development of Generative AI to generate Raster images that seeks to predict the state of water bodies given a future weather forecast, trained based on the combination of historical image data from satellites in that region, with their respective weather forecasts;
- Support from institutions to obtain sufficient Raster data (TIFF images) for AI training.

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