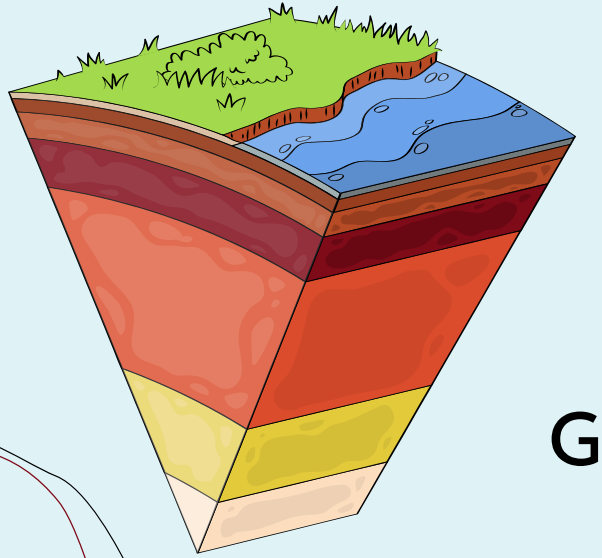
MDS Capstone



FaultSENS

Geophysical Data + Computer Vision

Alysen, Kun, Nicole, Sid + Rio Tinto Exploration (RTX)

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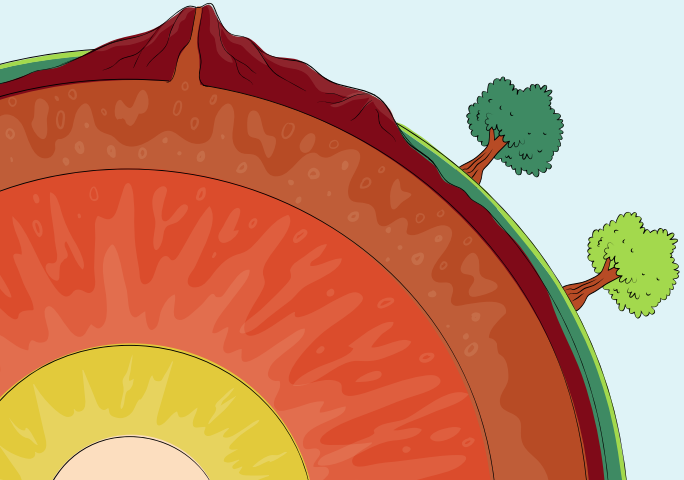
Introduction



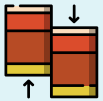
Our partner

Rio Tinto

What is a Fault?

Reverse

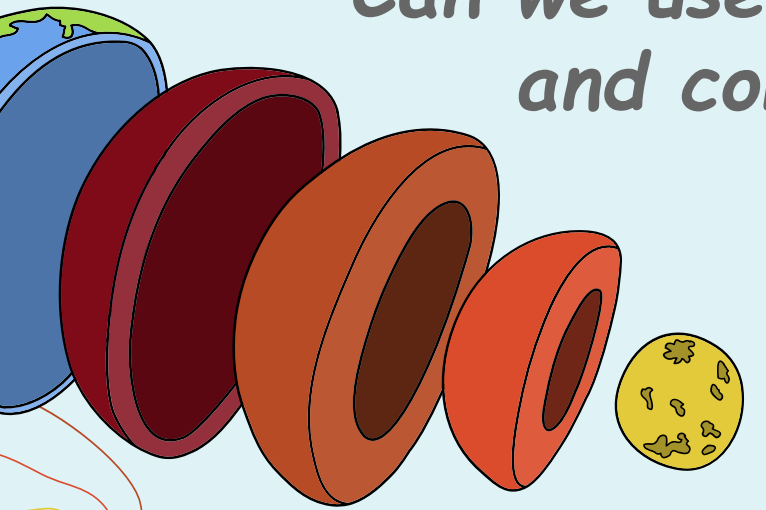
Strike Slip



Normal

What is the Problem Statement?

"Can we use geophysical datasets and computer vision / ML to ***MAP FAULTS*** *?"*



Why does it Matter?

- **REDUCE** significantly the **TIME** required for fault analysis.
- **SCALE** this efficiency across various locations.
- Obtain **QUANTIFIABLE** measurements.

What are we trying to achieve?

- **WHICH** specific **FEATURES** enhance prediction accuracy the most?
- **WHERE** are the faults located?

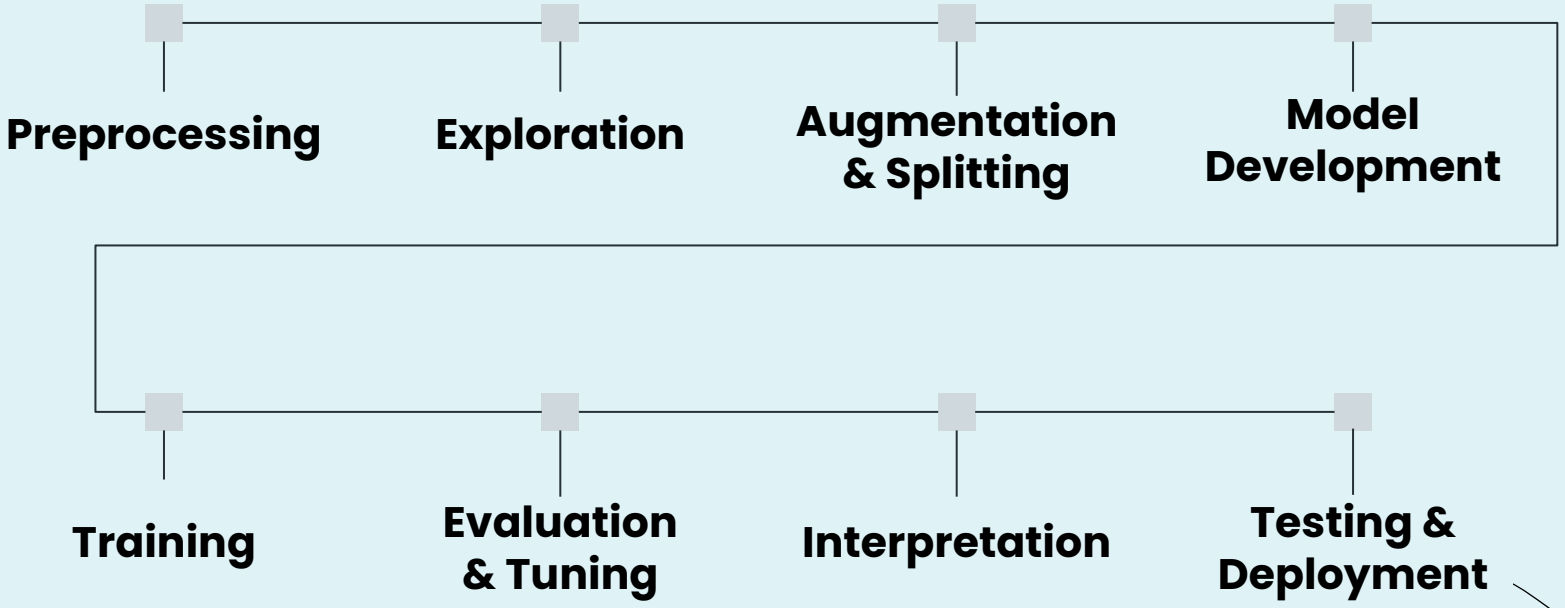
Feature Selection

Object Localization

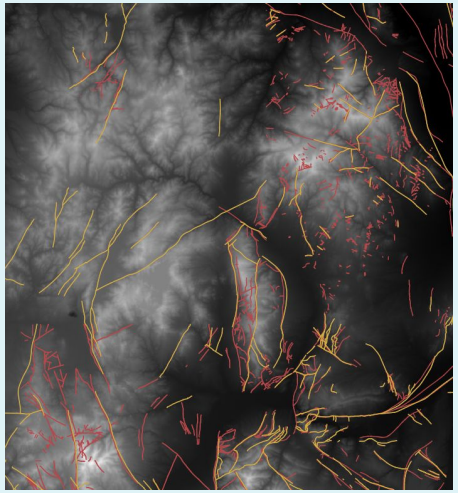
02

Data Science Techniques

Workflow


Preprocessing
Exploration
Augmentation & Splitting
Model Development
Training
Evaluation & Tuning
Interpretation
Testing & Deployment

Exploration

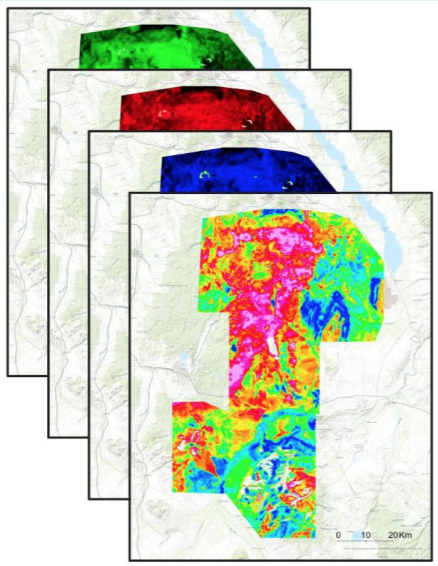


+

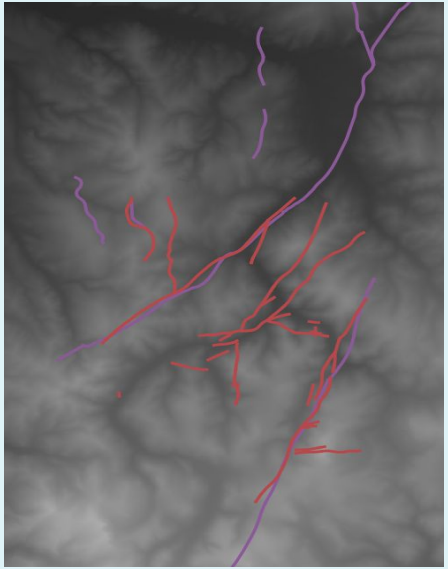
- MT
  - Boulder_USGS_Merged_2022_MAG_ASIG.tfw
  - Boulder_USGS_Merged_2022_MAG_ASIG.tif
  - Boulder_USGS_Merged_2022_MAG_ASIG.tif.aux.xml
  - Boulder_USGS_Merged_2022_MAG_ASIG.tif.ovr
  - Boulder_USGS_Merged_2022_MAG_ASIG.tif.xml
  - Boulder_USGS_Merged_2022_MAG_RTP_1VD.tfw
  - Boulder_USGS_Merged_2022_MAG_RTP_1VD.tif
  - Boulder_USGS_Merged_2022_MAG_RTP_1VD.tif.aux.xml
  - Boulder_USGS_Merged_2022_MAG_RTP_1VD.tif.ovr

= ??

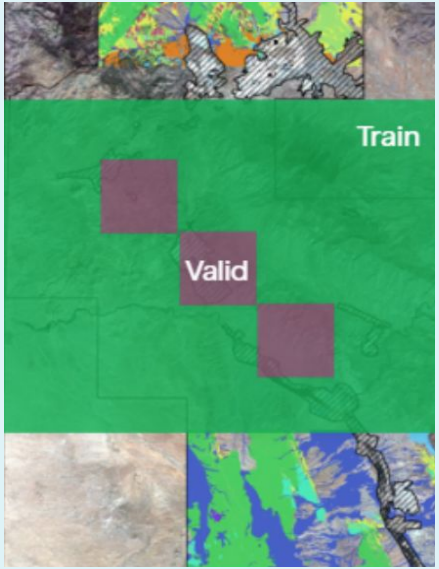
Augmentation & Splitting



Input Channels (Raster Layers)



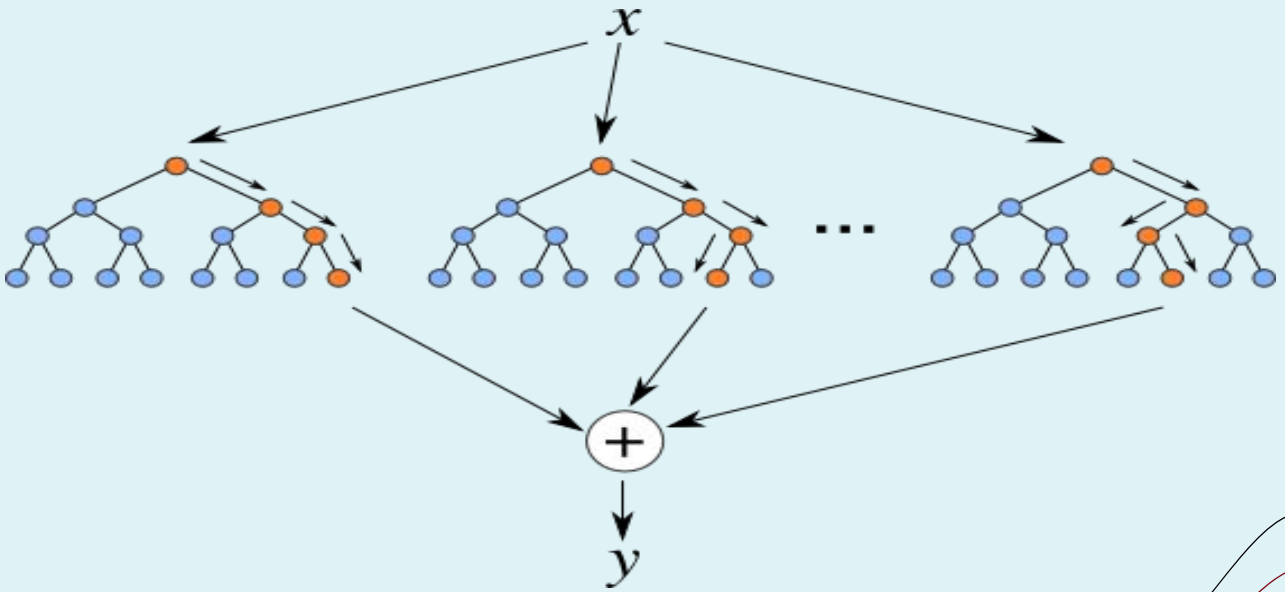
Rasters with fault lines overlaid



Train Valid Geospatial Split

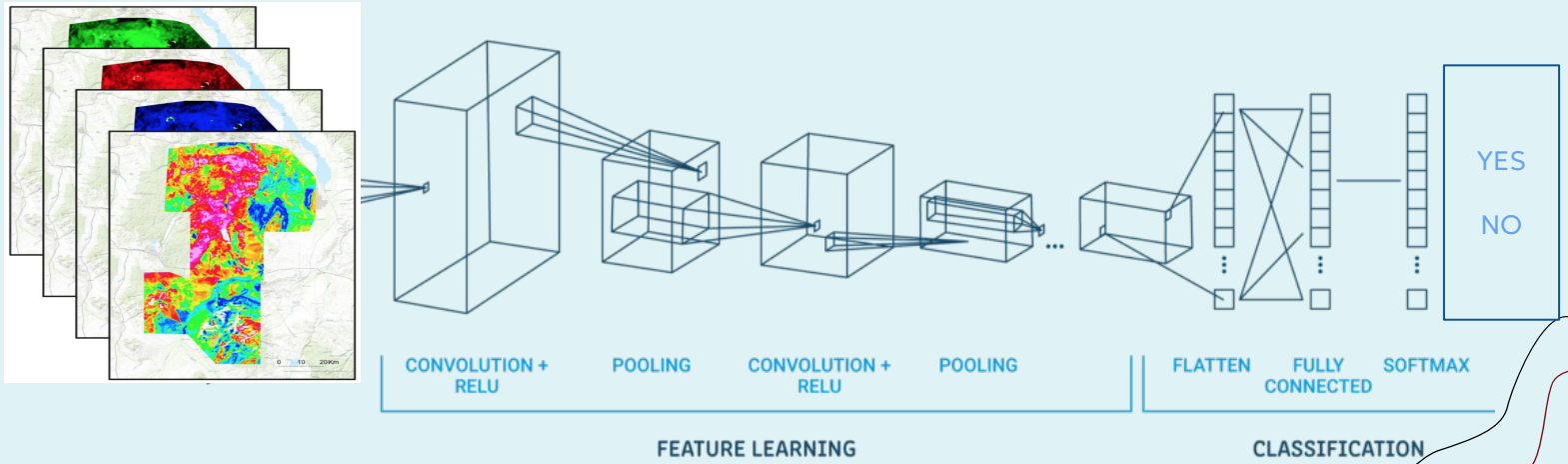
Modelling - Baseline

Random Forest Classifier (RF)



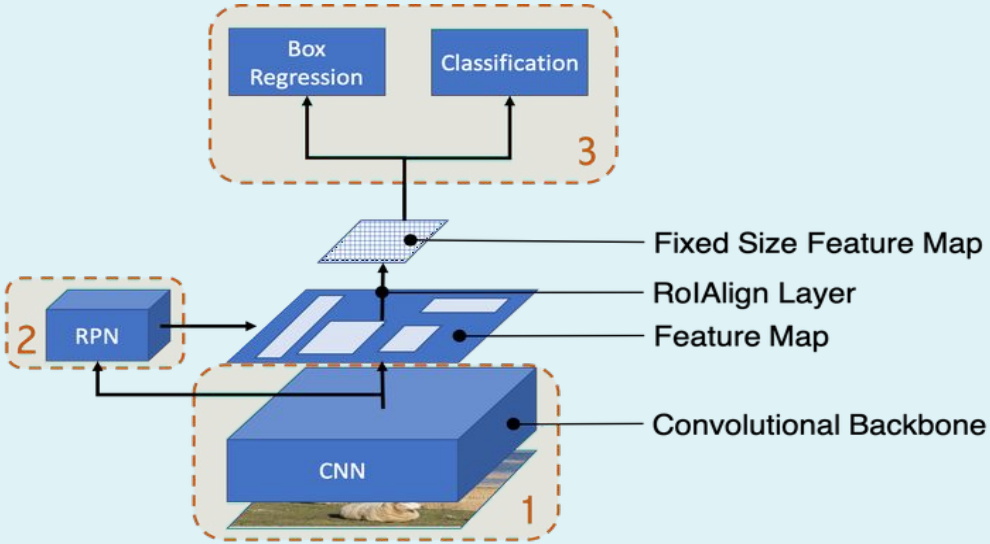
Modelling - Baseline

Convolutional Neural Network (CNN)



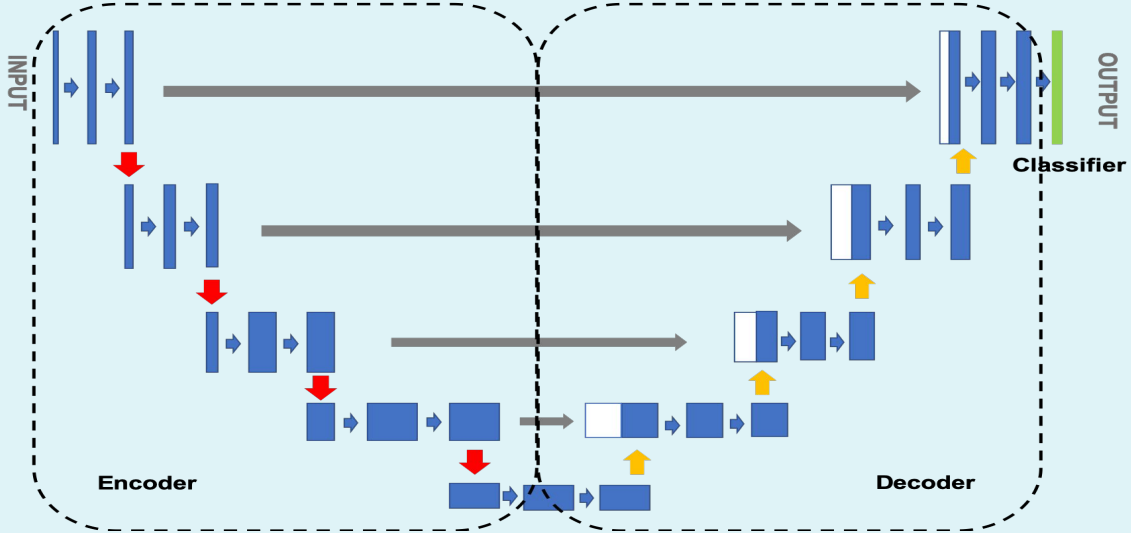
Target Models

Region-based CNN (R-CNN)

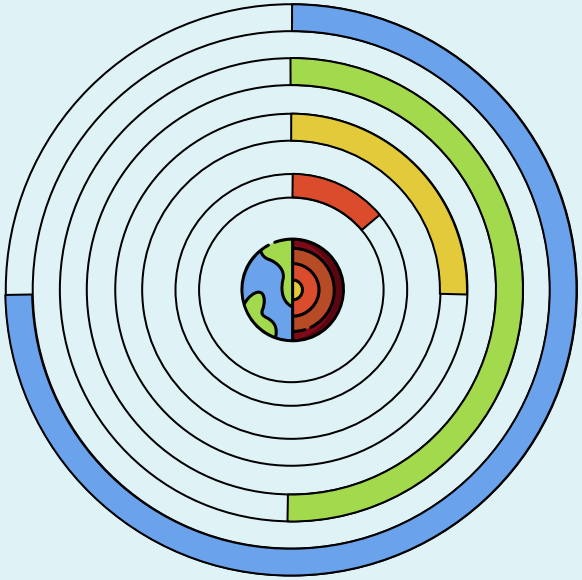


Target Models

UNet



Evaluation Metrics



Precision

% correct predictions

Recall

True positive rate

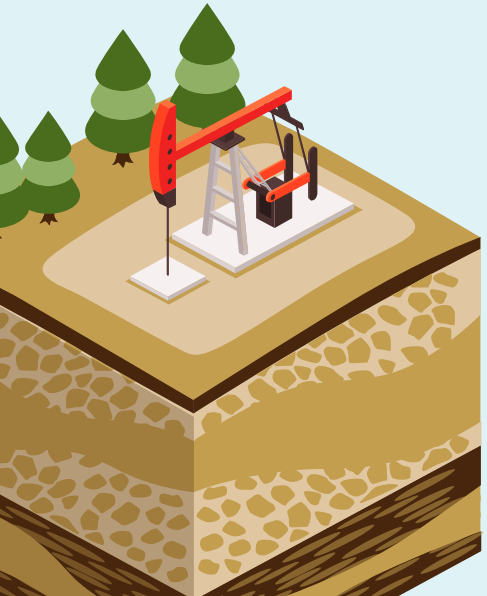
IoU

Overlap b/w bounding box and ground truth

mAP

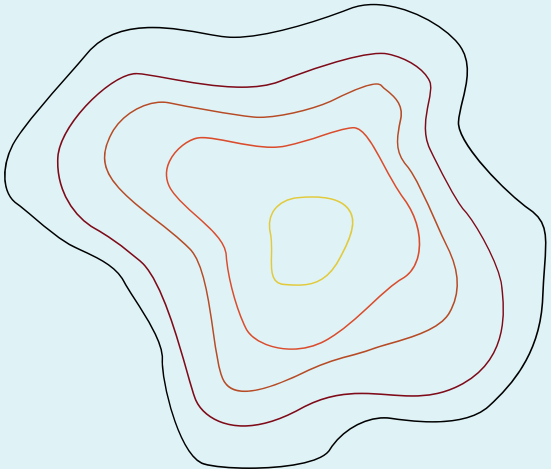
Precision values at various IoU thresholds [0, 1]

03



Timeline

Timeline



Week 1 - 2

Preparation & Proposal - 2 weeks

Week 1: Proposal presentation

Week 2: Proposal Report & Data Exploration

Week 3 - 6

Development - 4 weeks

Week 3: Binary model training and testing

Weeks 4-5: Advanced model Development

Week 6: Pipelining

Week 7 - 8

Delivery - 2 weeks

Week 7: Final Presentation

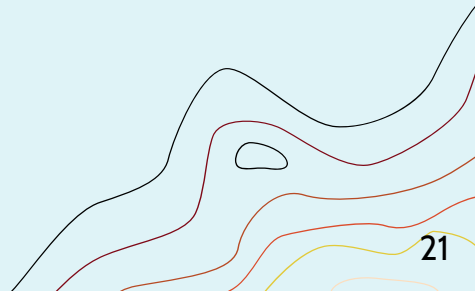
Week 8: Draft Data Product & Report

Week 9

Final data product and report

Thank You!

Questions?



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- Random Forest for Image Classification Using OpenCV - MachineLearningMastery.com
- A Gentle Introduction to Object Recognition With Deep Learning - MachineLearningMastery.com
- Plate Tectonics and Earthquakes | Google Slides & PPT (slidesgo.com)