ChAllenge Data
By MathA

ENS | PSL

COLLÈGE DE FRANCE 1530

INSTITUT Louis Bachelier

CorroSeg: Corrosion Detection in Wells

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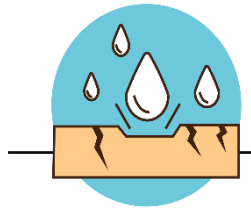
slb

Cement & Casing Integrity

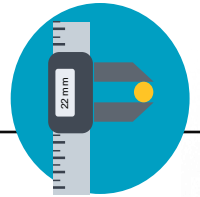
Well Integrity

A quality or condition of a well in being structurally sound with competent pressure seals by application of technical, operational and organizational solutions that reduce the risk of uncontrolled flow of fluids or gases from the formation, into another formation, or to the surface or environment throughout the well life cycle.

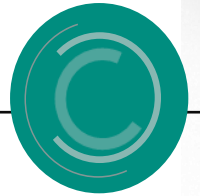
Casing Integrity Information



Corrosion



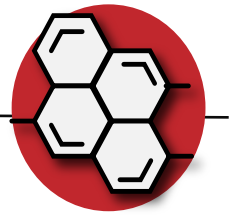
Thickness



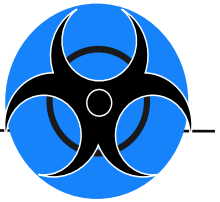
Deformity

Cement Quality Information

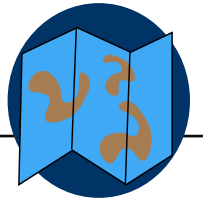
Bonding



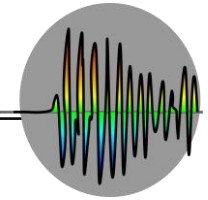
Contamination

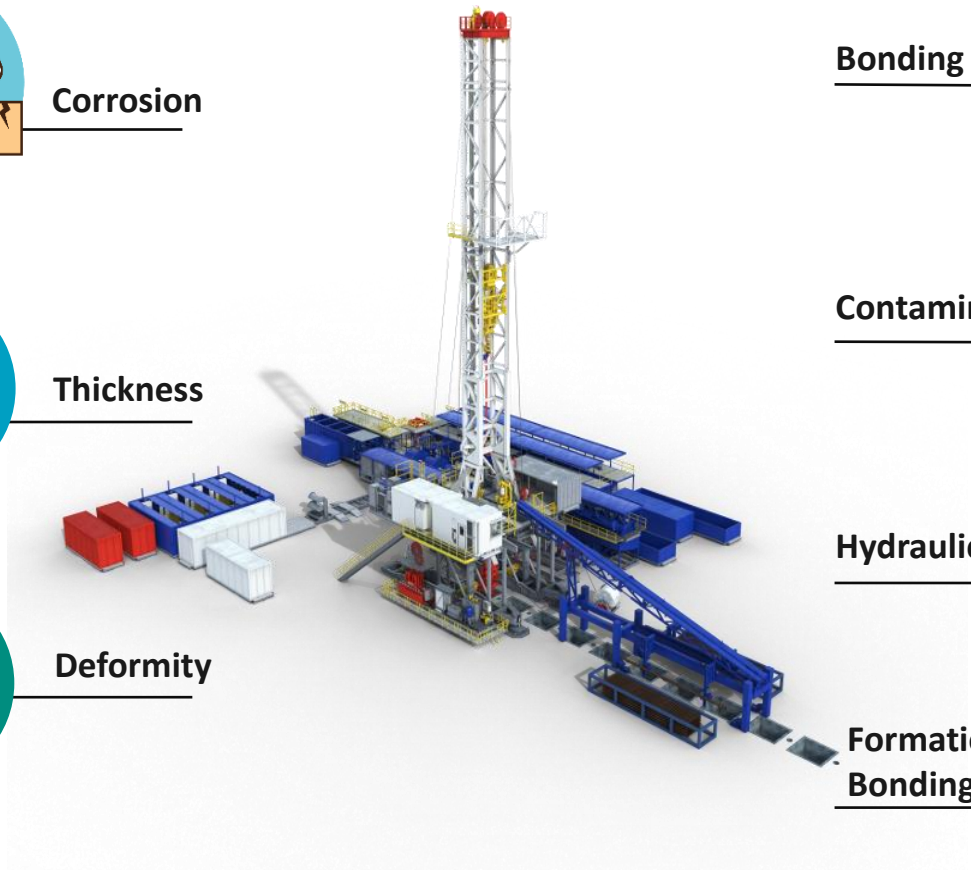


Hydraulic Map



Formation Bonding



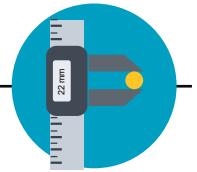


CONTEXT

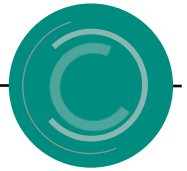
Casing Integrity Information

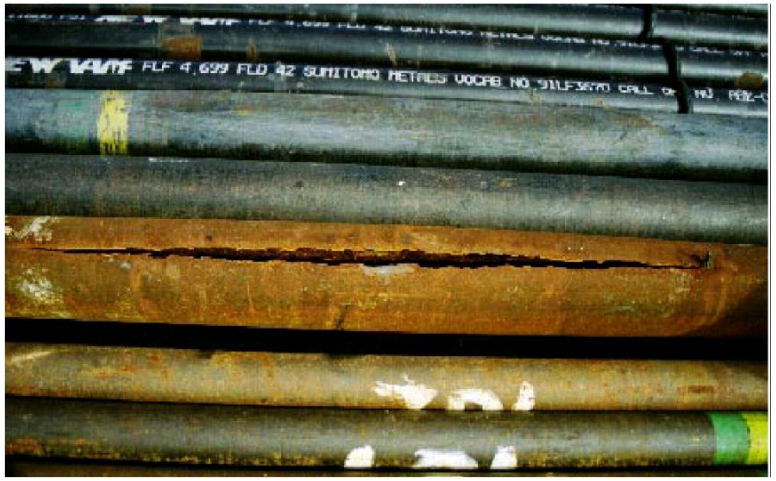
Corrosion
Internal or External

Thickness
Casing (OD-ID)



Deformity
Casing

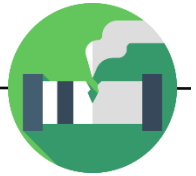




Consequences

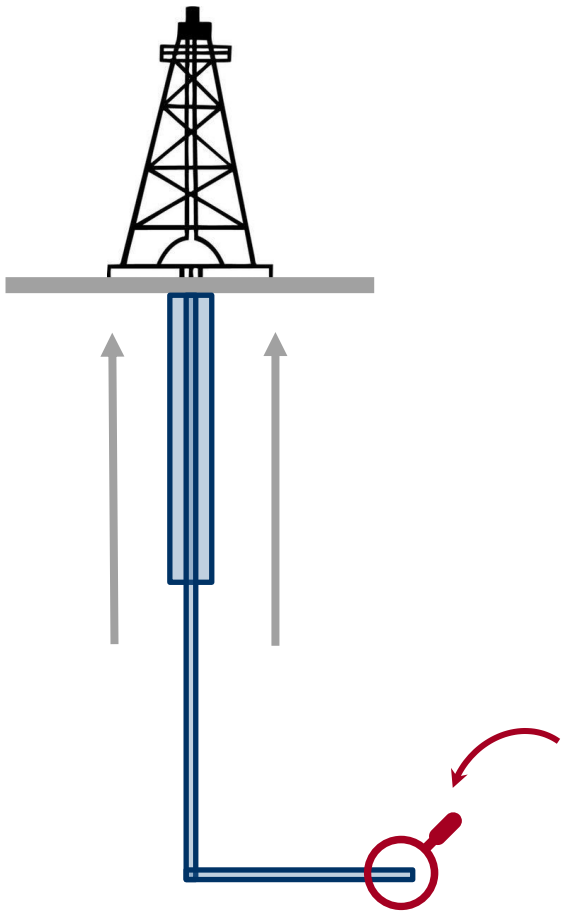
Groundwater Contamination

Gas Leakage



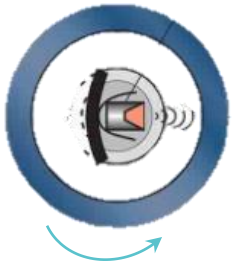
Land slide

ULTRASONIC IMAGER TOOL (USIT)

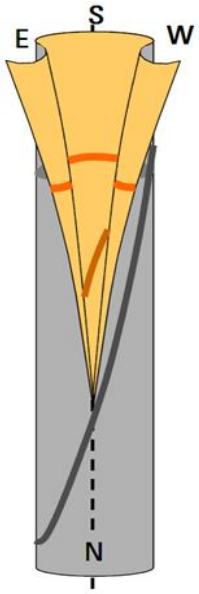


UltraSonic Imager Tool (USIT)

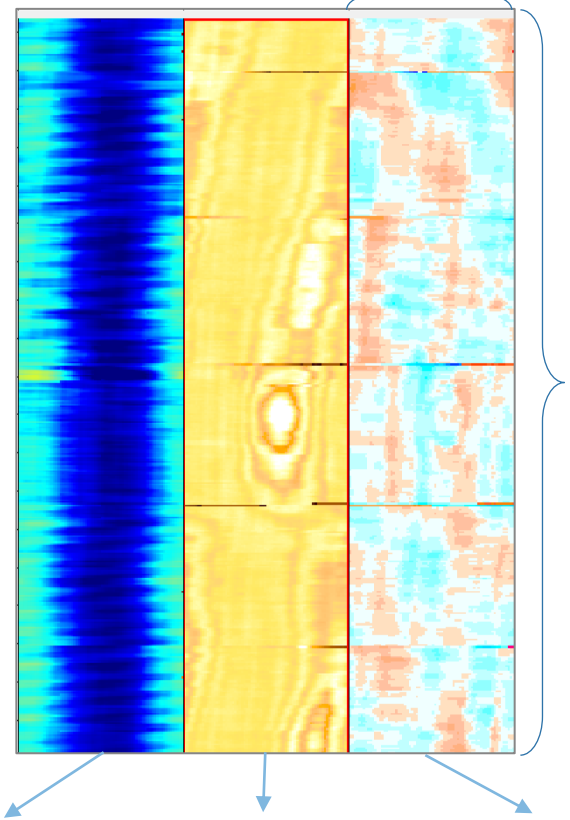
Transducer



Direction of rotation



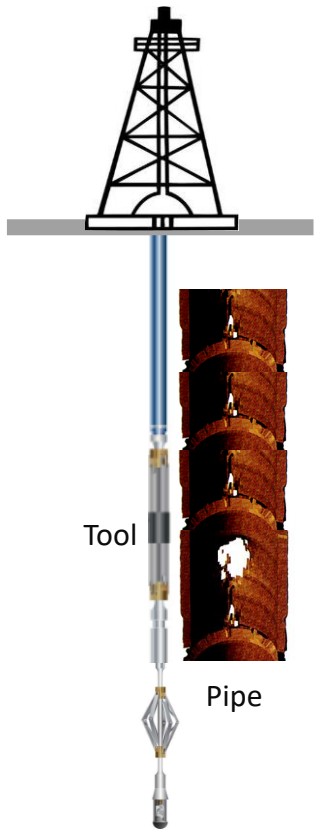
Borehole



Rotating sensor captures ultrasonic (US) waves reflected from cement inside the borehole

DATA

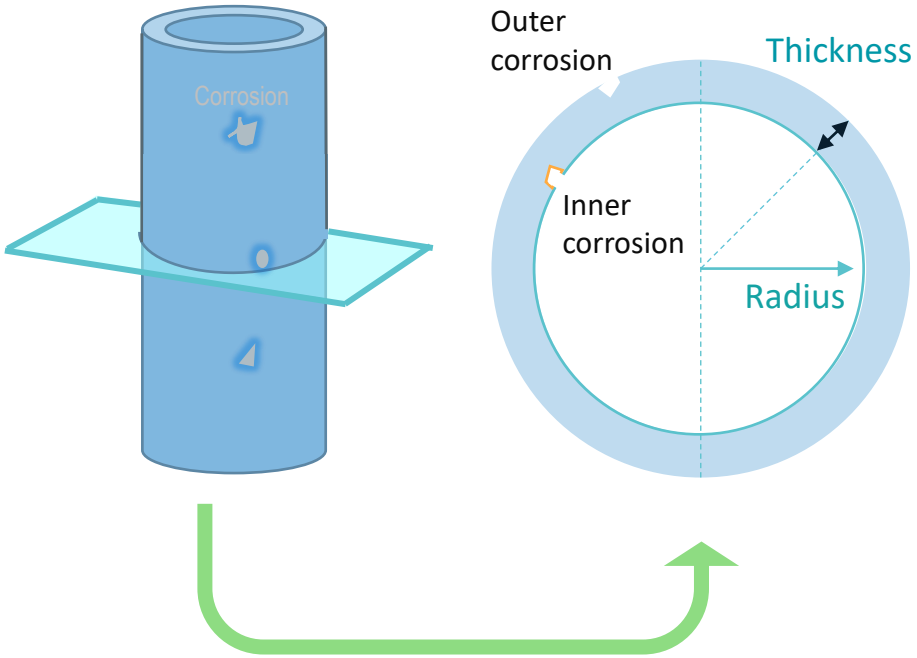
Data Acquisition



UltraSonic Imager Tool (USIT)

Goal

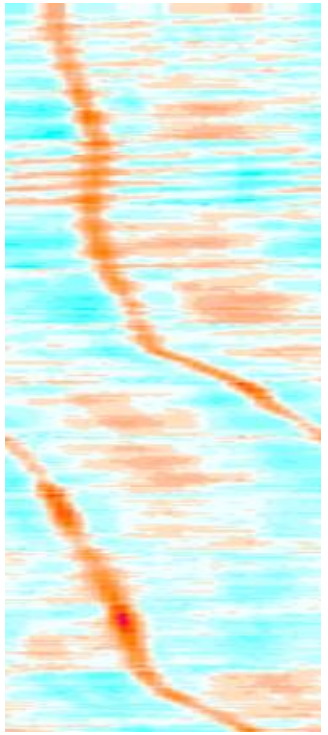
- Automating the identification of pipe defects
- Reduce expert manual analysis time
- Decrease interpretation subjectivity



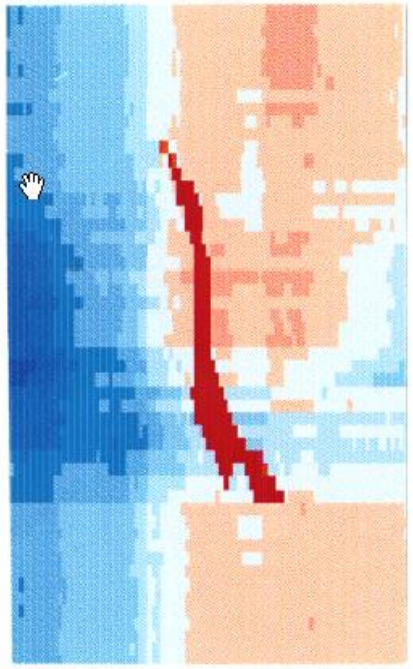
Pipe cross-section

THBK

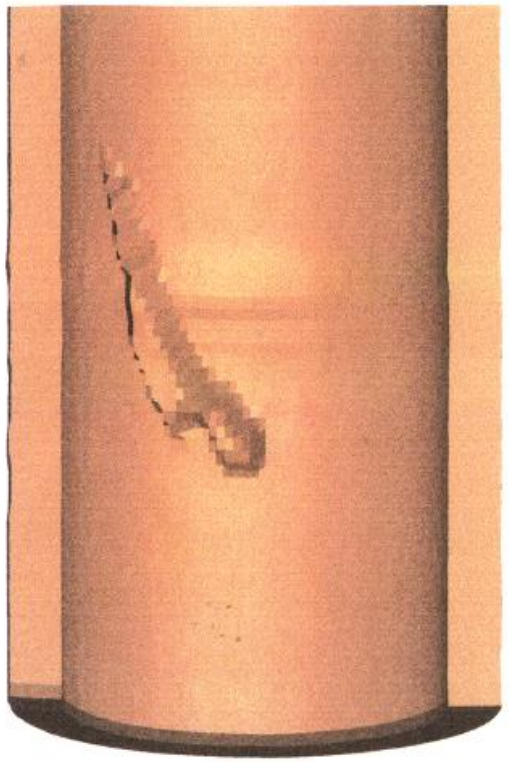
THBK: azimuthal variation of pipe thickness



DATA



Real Time UCI Image

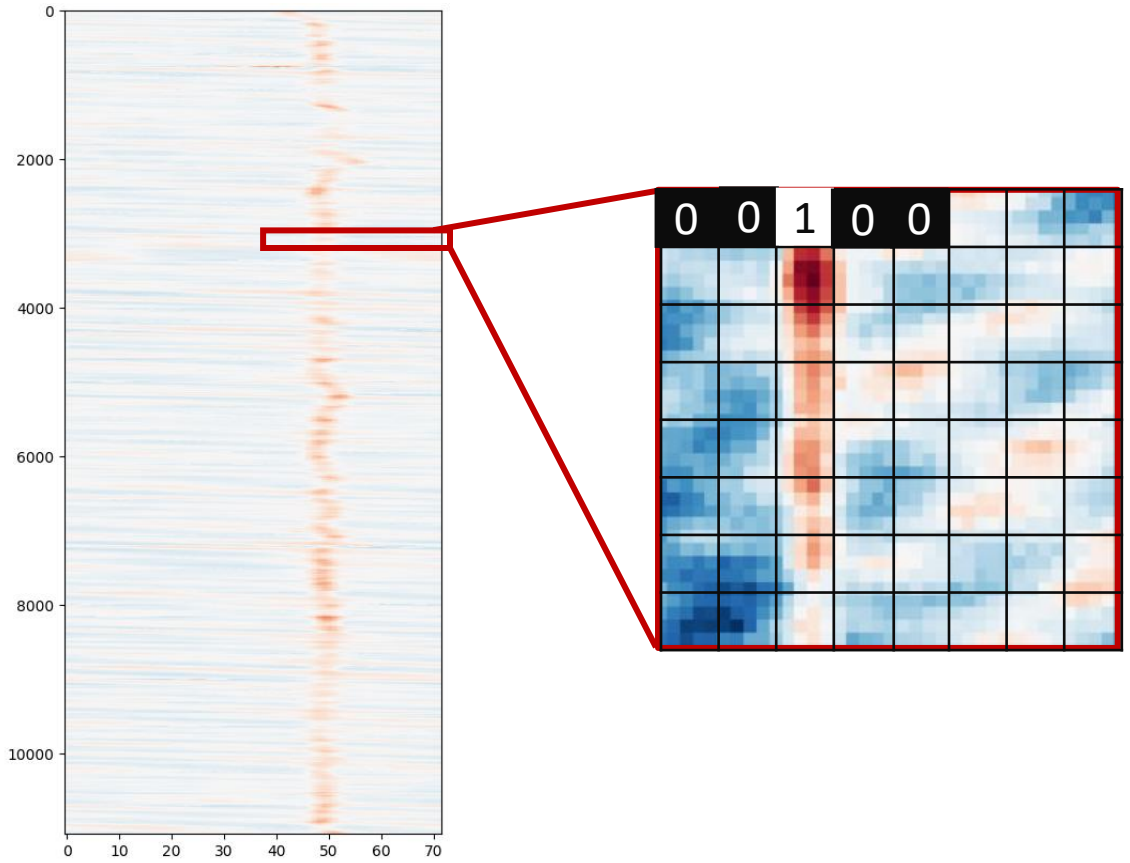


Enhanced Image

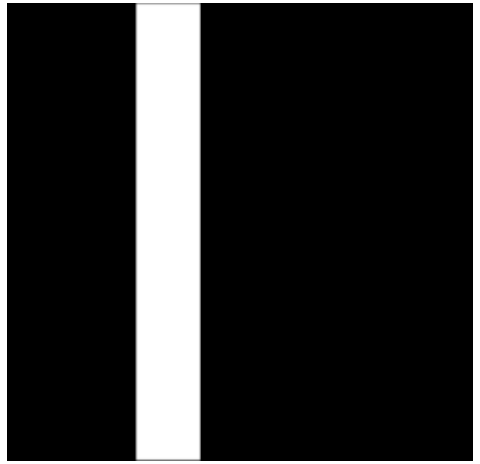
Pulled Pipe

TASK: BINARY SEGMENTATION

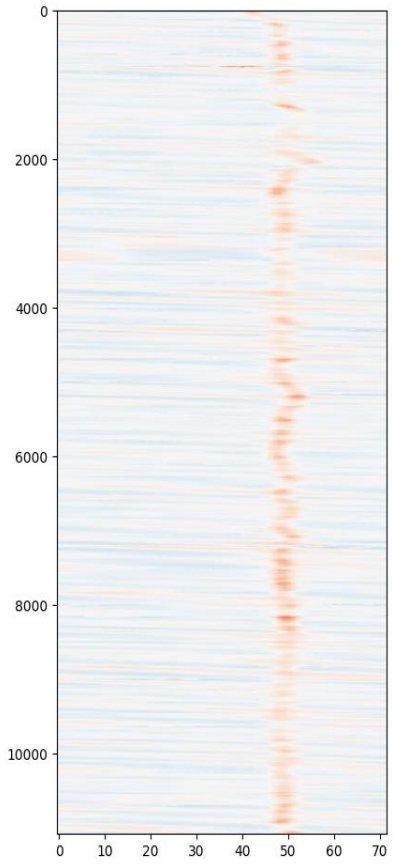
Image

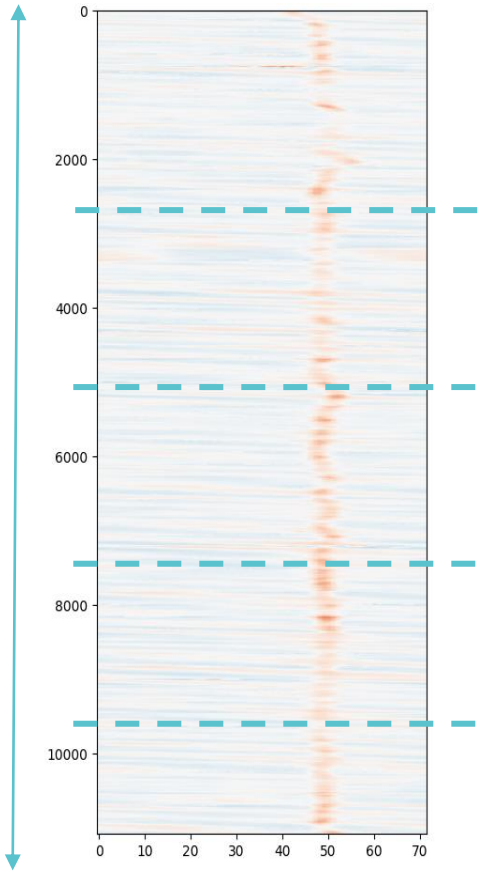


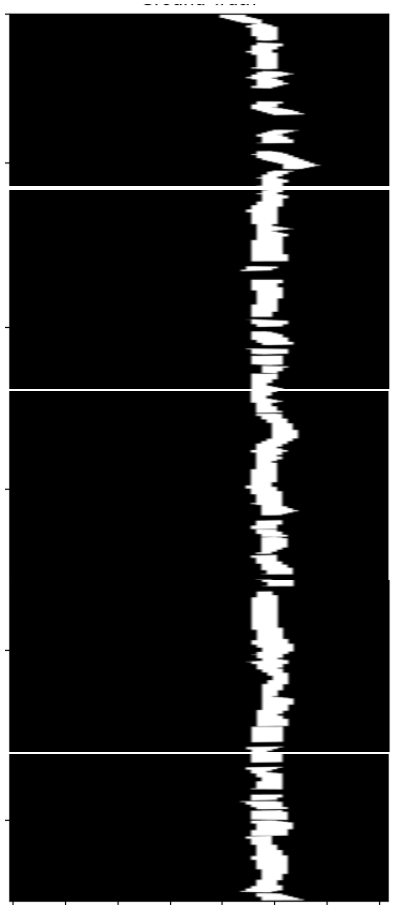
Label

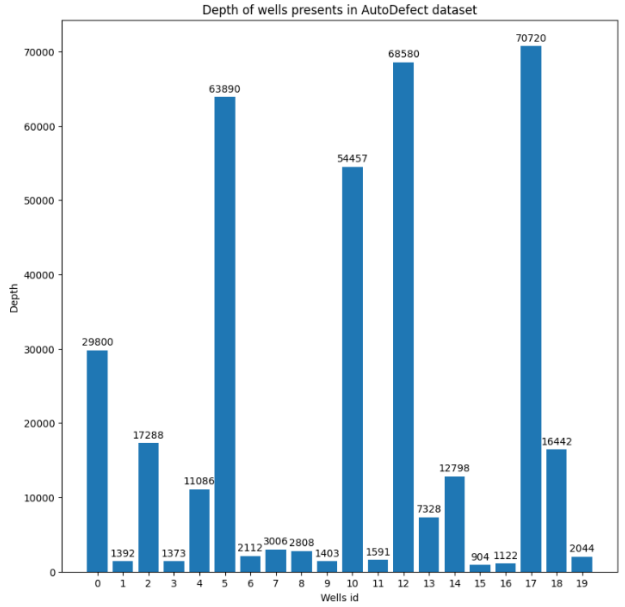


Difficulties & Challenges









Continuity issue

Long images

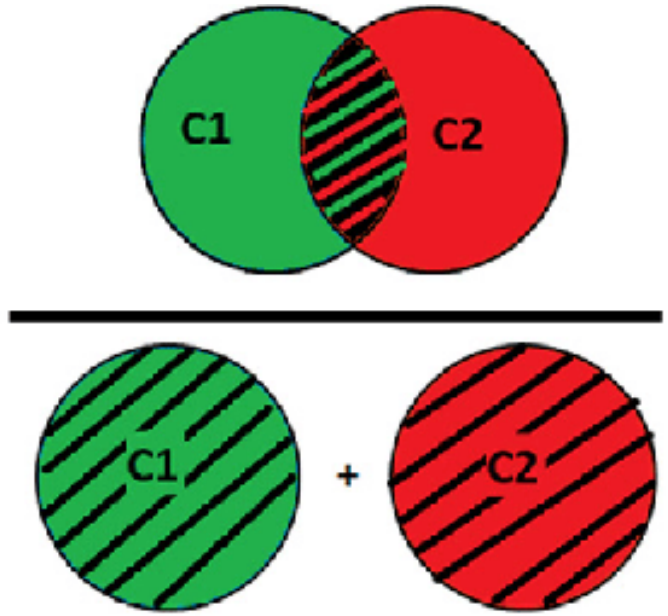
Imbalance Foreground & Background

Few wells (impact data-distribution)

EVALUATION

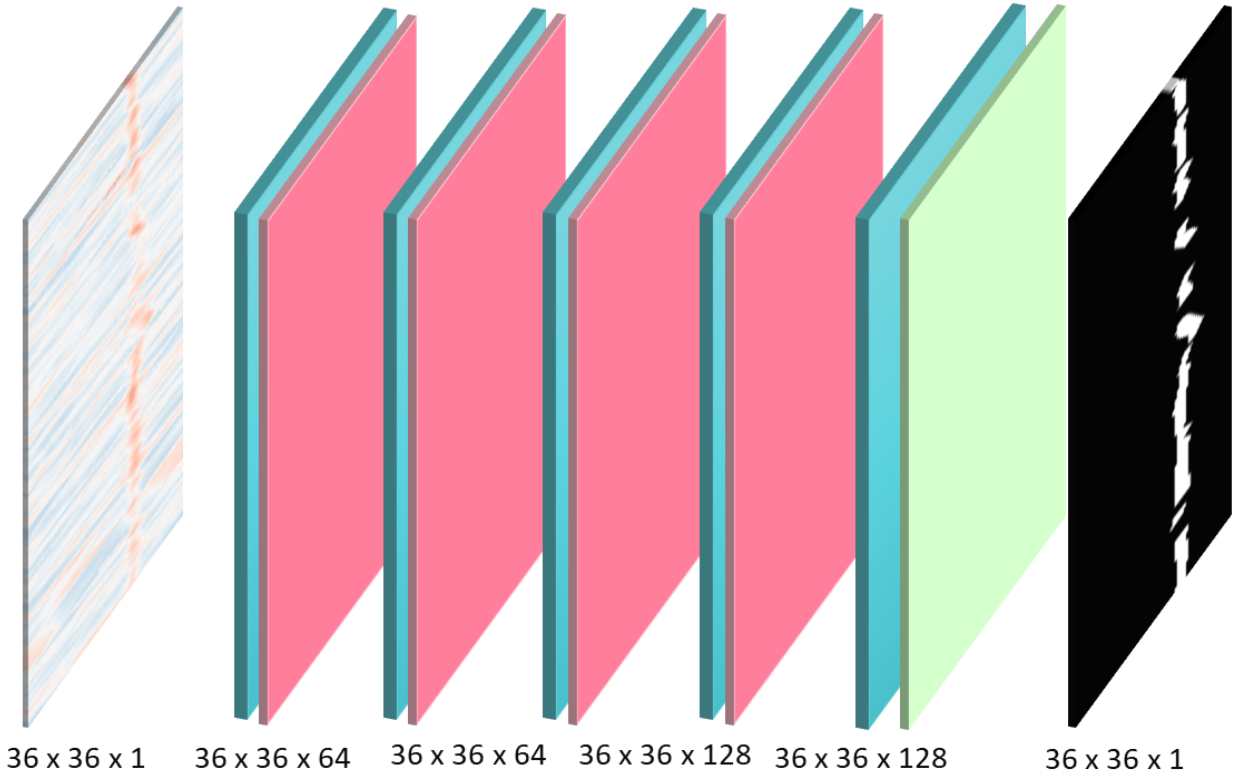
$$\text{Dice Coefficient} = 2 \times \frac{|C1 \cap C2|}{|C1| + |C2|}$$

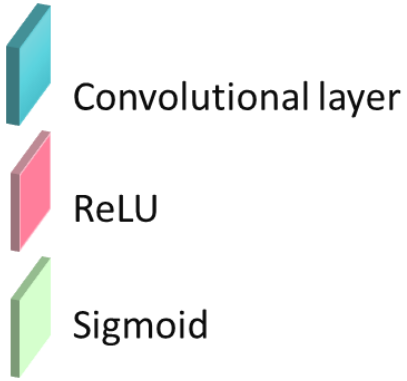
$$= 2 \times$$



Baseline score: 0.49

BASELINE





Model

- CNN with 5 layers
- No pooling

Training hyperparameters

- Batch size: 128
- Learning rate: 0.001
- Loss: DiceBCE
- Optimizer: Adam