

CASE STUDY

**Machine Learning Saves Time
and Money in Seismic Data
Interpretation**

softserve

Client Background

Our client is an American energy corporation and prominent oil company engaged in petroleum exploration and production all over the world.

Business Challenge

The workflow of seismic interpretation requires extensive manual work for experts to label seismic data volumes based on visual inspection. Labeled data is used to make important business decisions and serves as an input to further processes.

Our client was seeking a way to overcome challenges that geophysicists and exploration/production engineers face in their work, including:

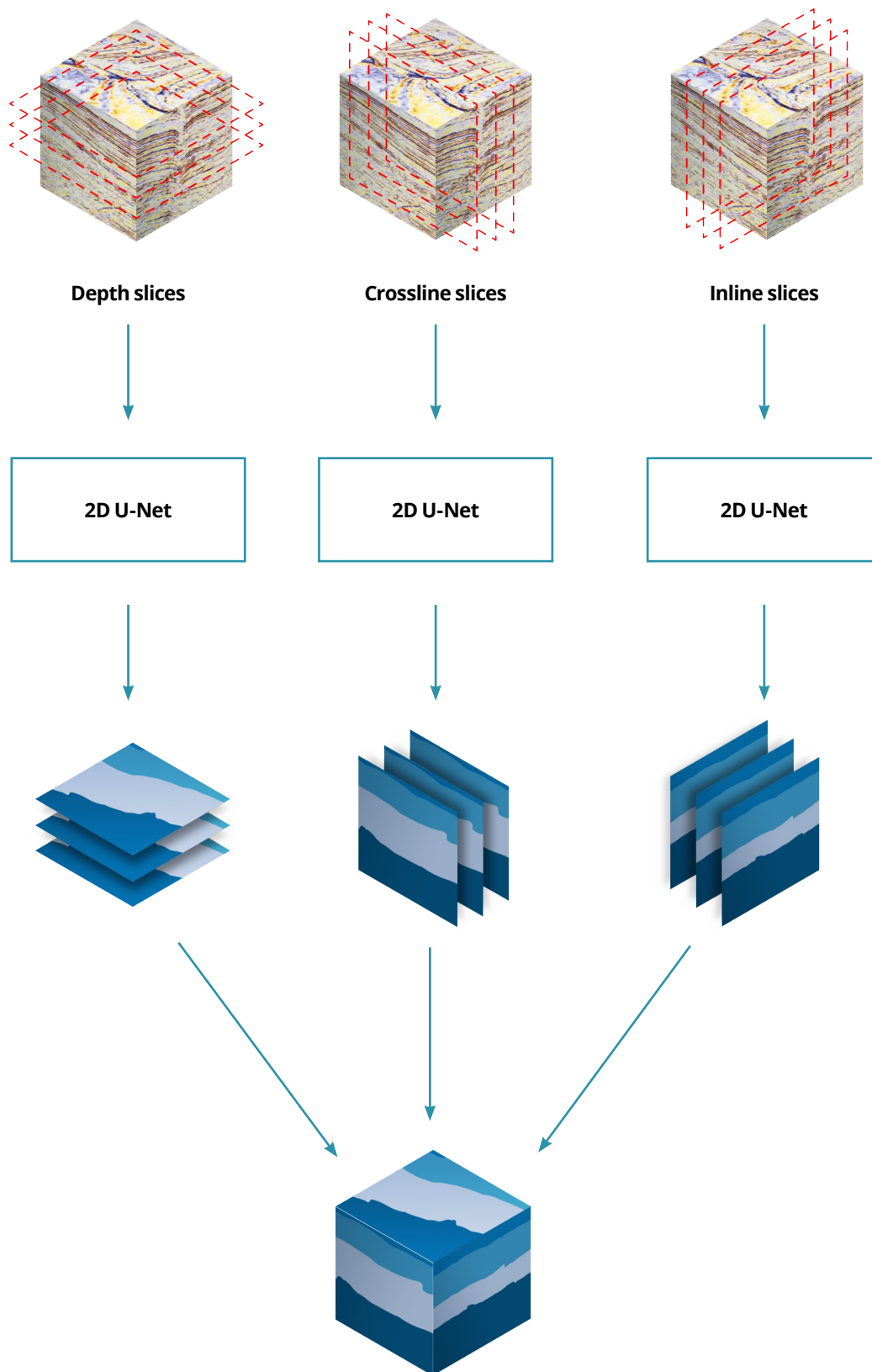
- **Time consumption:** Manual seismic data labeling is time-consuming-taking weeks, months, or even longer
- **Interpretation errors:** Data interpretation is prone to human errors and depends on an expert level of knowledge

Project Description

The goal of the project was to prove the feasibility of a deep learning (DL) approach to segment geological volumes and assign specific rock type formation labels to each pixel in the provided volumes. The approach was tested with different deep neural network architectures. The data used for training was manually labeled by experts on the client's side.

SoftServe's experts used state-of-the-art segmentation architectures like U-Net and FPN for automatic geological data segmentation. The trained PoC tool takes non-labeled seg-y file volumes as an input and generates seg-y labeled cubes. Each 3D cube was split into 2D slices. This approach allowed our team to efficiently train networks with low amounts of 3D data via transfer learning.

Additionally, generated statistics and predicted classes were incorporated into an ontology tree. The ontology tree is built based on volume predictions. This tree represents the relations between the geo bodies in the cube. The region itself may be the root node, whereas all child nodes would represent the corresponding geo-bodies found in the volume. It may be built for any of the geo-bodies to examine further relations or unique features.



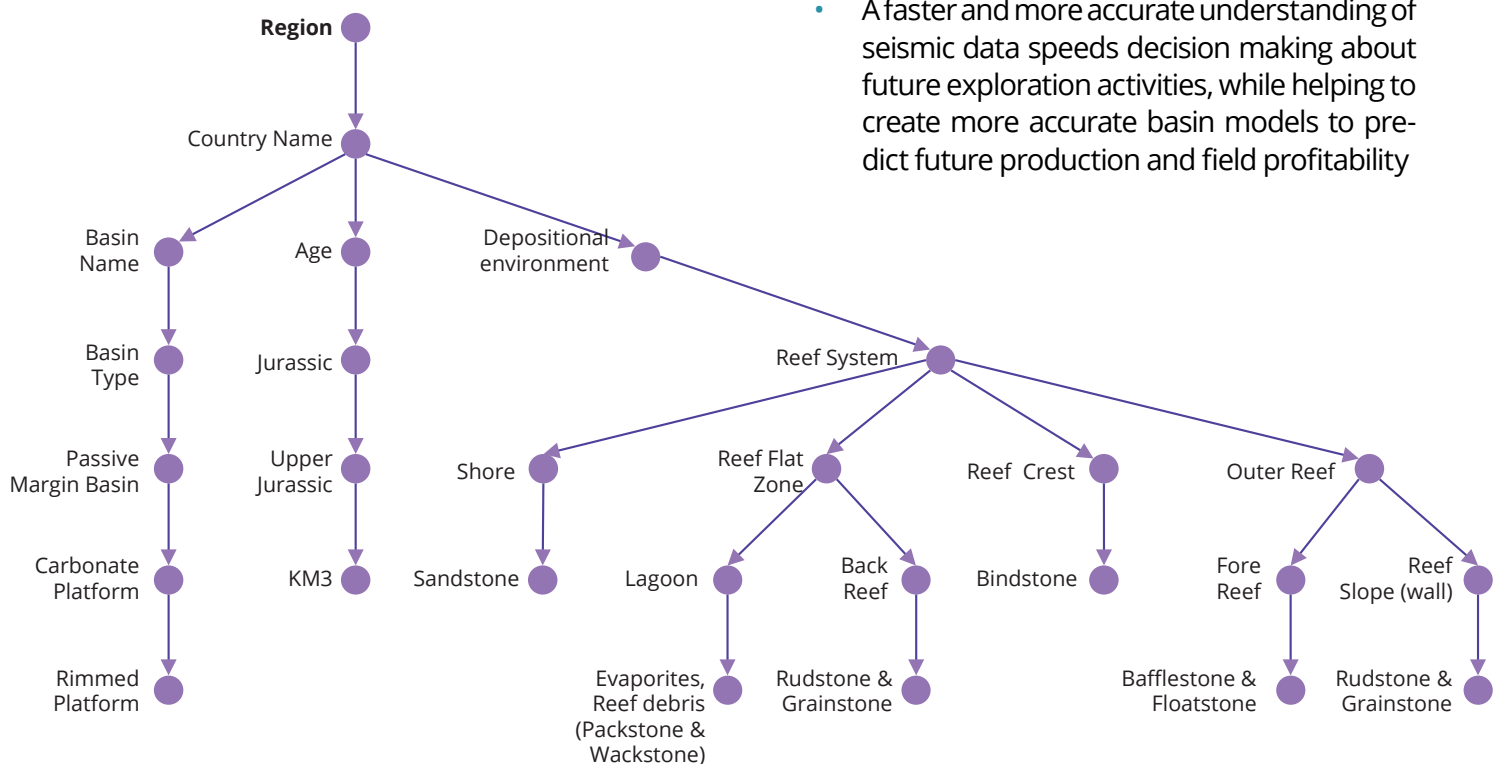
Tools and Technologies

- GPU-powered GCP instance for training models and processing data
- PyTorch — an open-source deep learning library
- Gitlab repository for storing the source code
- Jupyter Notebook for data visualization

Value Delivered

This PoC project proved the feasibility of seismic data interpretation using state-of-the-art algorithms in computer vision, as well as the possibility of end-to-end pipeline for model training and 3D seismic volumes interpretation. The solution can be further applied for interpretation of all types of seismic geo-bodies.

- Usage of DL technologies for geological data interpretation addresses the analysis of large volumes of data and understanding the relationship of various types of geological data simultaneously
- Our solution helps to interpret large amounts of seismic data significantly faster and to avoid human bias errors
- A faster and more accurate understanding of seismic data speeds decision making about future exploration activities, while helping to create more accurate basin models to predict future production and field profitability



ABOUT US

SoftServe is a digital authority that advises and provides at the cutting-edge of technology. We reveal, transform, accelerate, and optimize the way enterprises and software companies do business. With expertise across healthcare, retail, media, financial services, software, and more, we implement end-to-end solutions to deliver the innovation, quality, and speed that our clients' users expect.

SoftServe delivers open innovation—from generating compelling new ideas, to developing and implementing transformational products and services.

Our work and client experience is built on a foundation of empathetic, human-focused experience design that ensures continuity from concept to release.

We empower enterprises and software companies to (re)identify differentiation, accelerate solution development, and vigorously compete in today's digital economy—No matter where you are in your journey.

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