Aramco Technathon Automated Seismic Data Interpretation

INTEGRAL-M TEAM

Problem

- Interpretation of seismic data **requires a lot of work of highly qualified geophysicists**
- **Human factor** is a major problem in seismic data interpretation
- **No easy way exists** to at least highlight main areas of interest for geophysicists and reduce monotonous workload

Solution

AI-powered self-learning app which provides:

FAST SEGMENTATION

of seismic horizons

PROBABILITY PREDICTIONS

for faults and traps

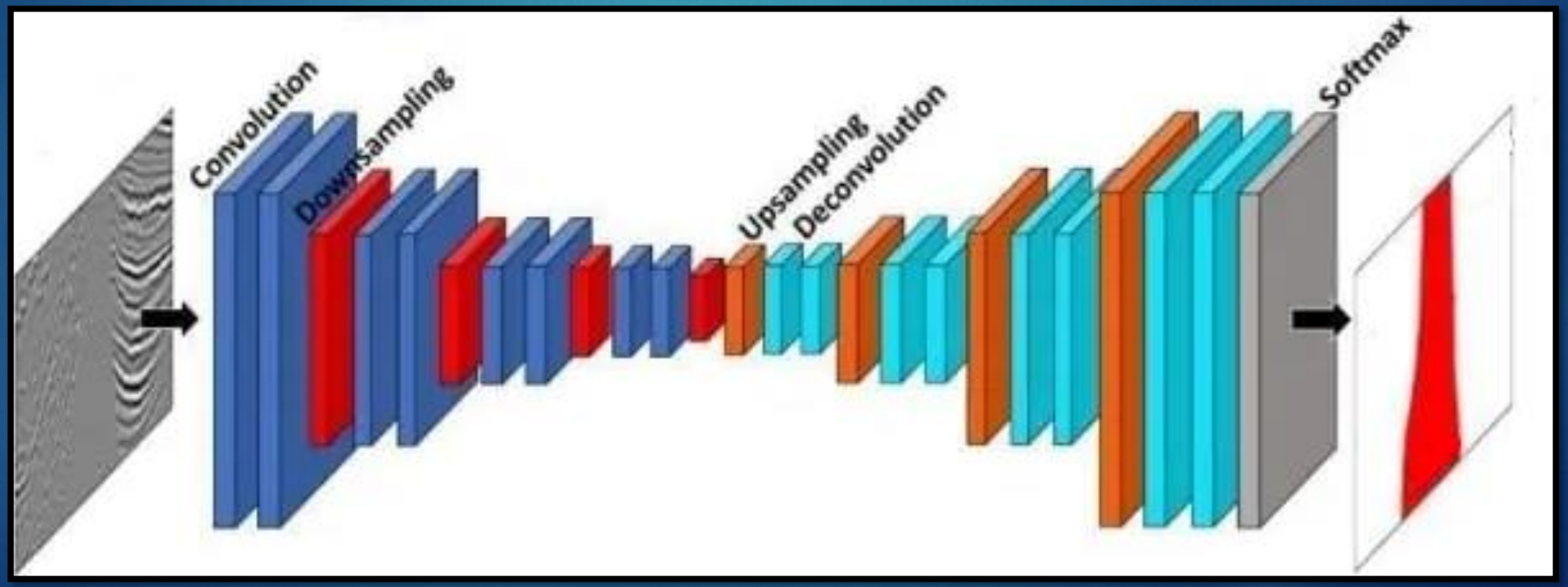
EASY-TO-USE INTERFACE

with visualization

System Architecture

Separate CNNs for each task

- Horizons: Unet-1024 multiclass semantic segmentation
- Traps and faults: Resnet-50 for segmentation and Resnet-based Bayes classifier



System Architecture Details

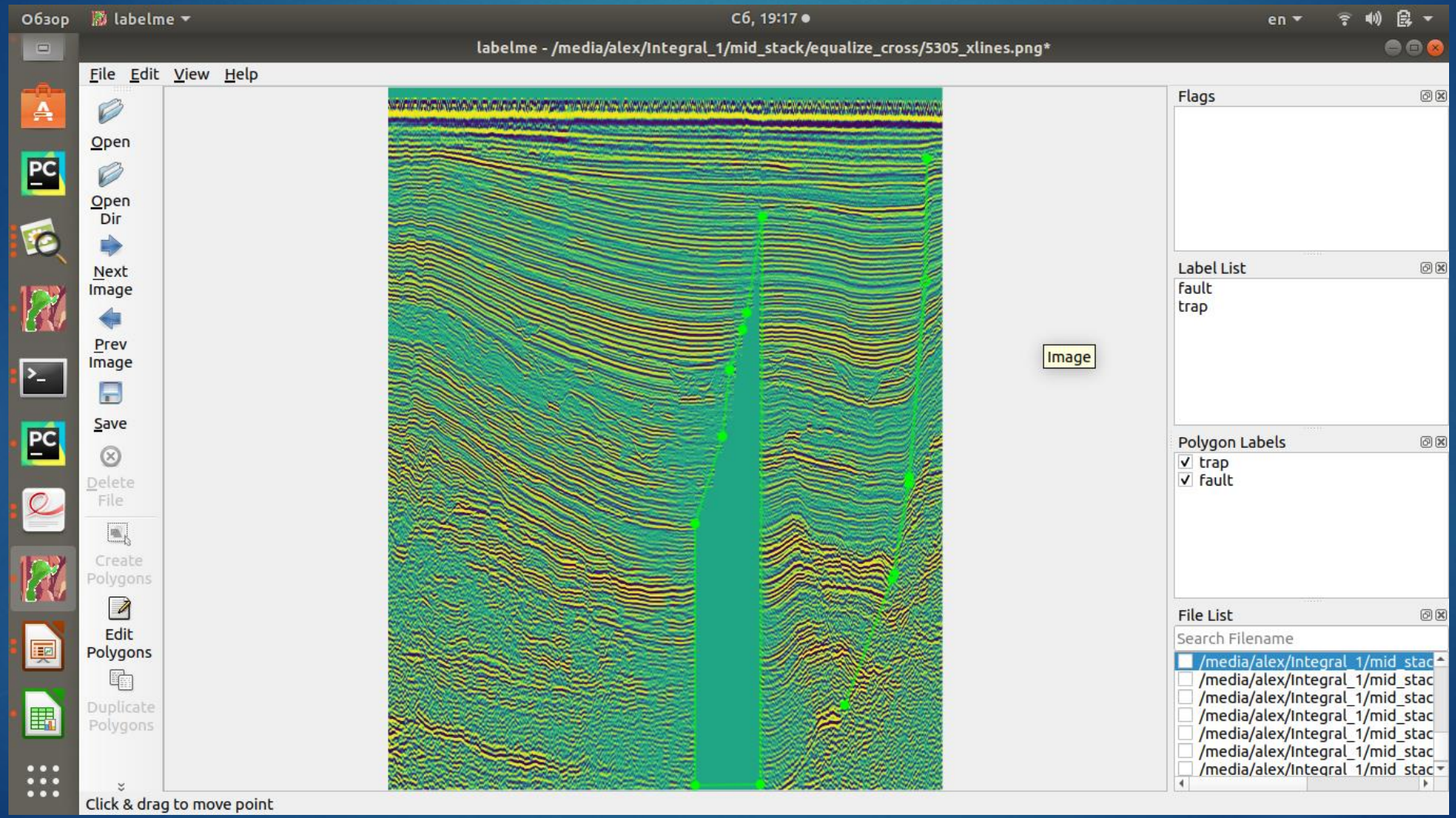
For seismic horizons

- Unet-1024 multiclass semantic segmentation
- Datasets: Parihaka_PSTM, Penobscot, Netherland Open Seismic
- Results: 0.91 Dice for 7 classes on 30% test dataset

For faults and traps

- Resnet-50-based single class segmentation + Bayes binary classifier
- Datasets: Parihaka_PSTM, **with manual mark-up** (161 images)
- Results: Dice 0.94 for faults, 0.87 for traps on 10% test dataset

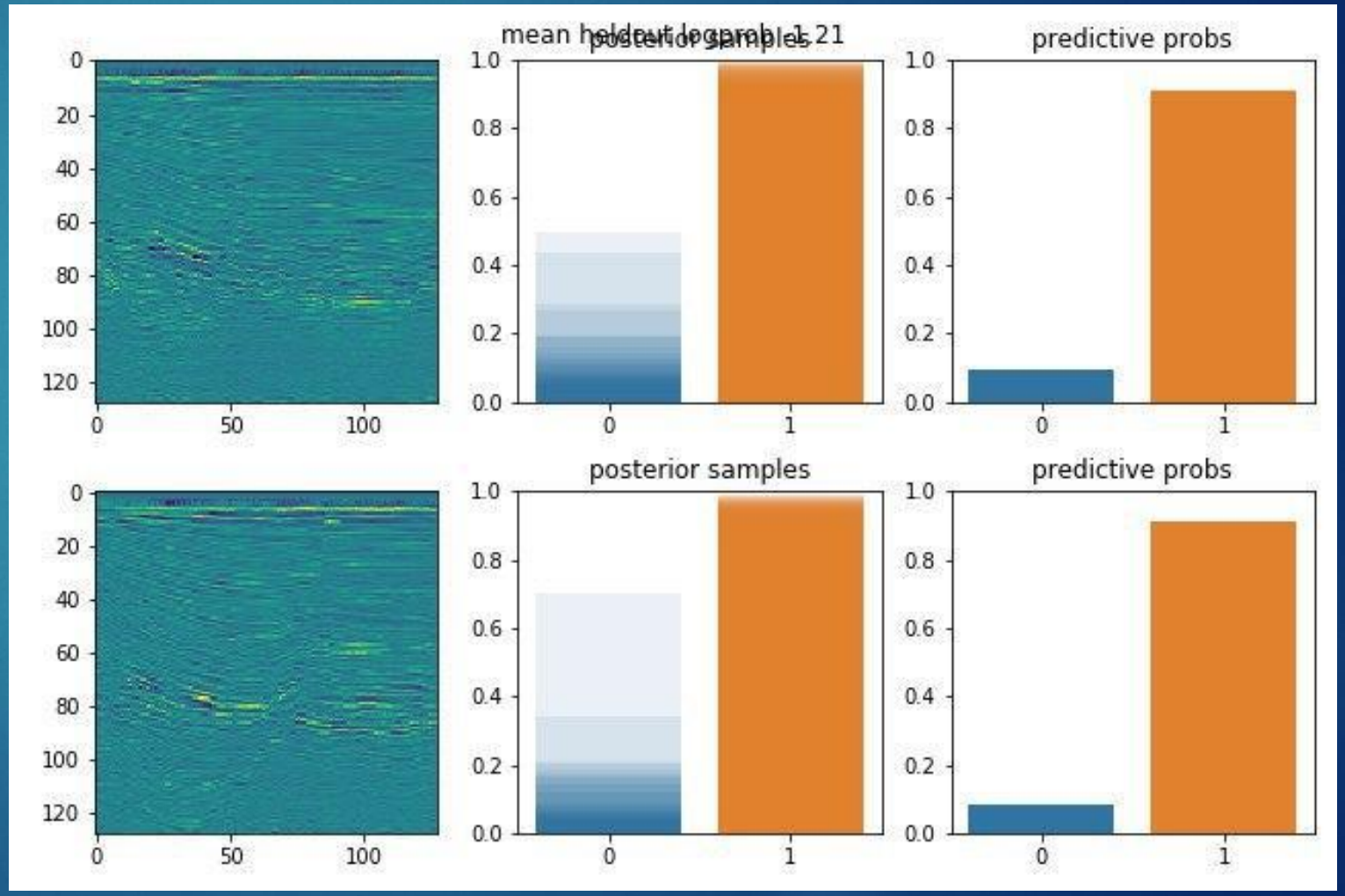
Manual mark-up: faults and traps



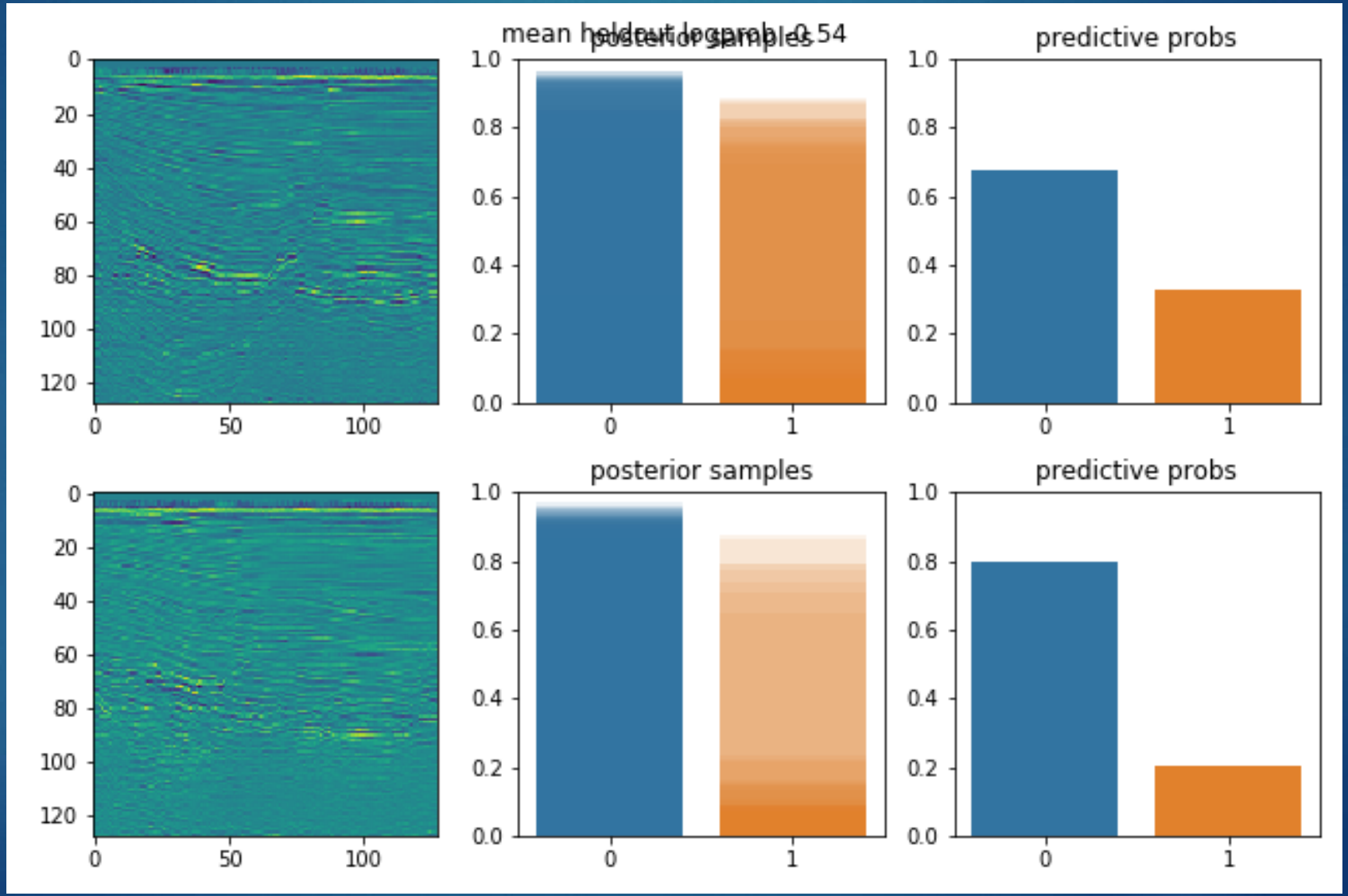
Innovative approach

Why Bayes?

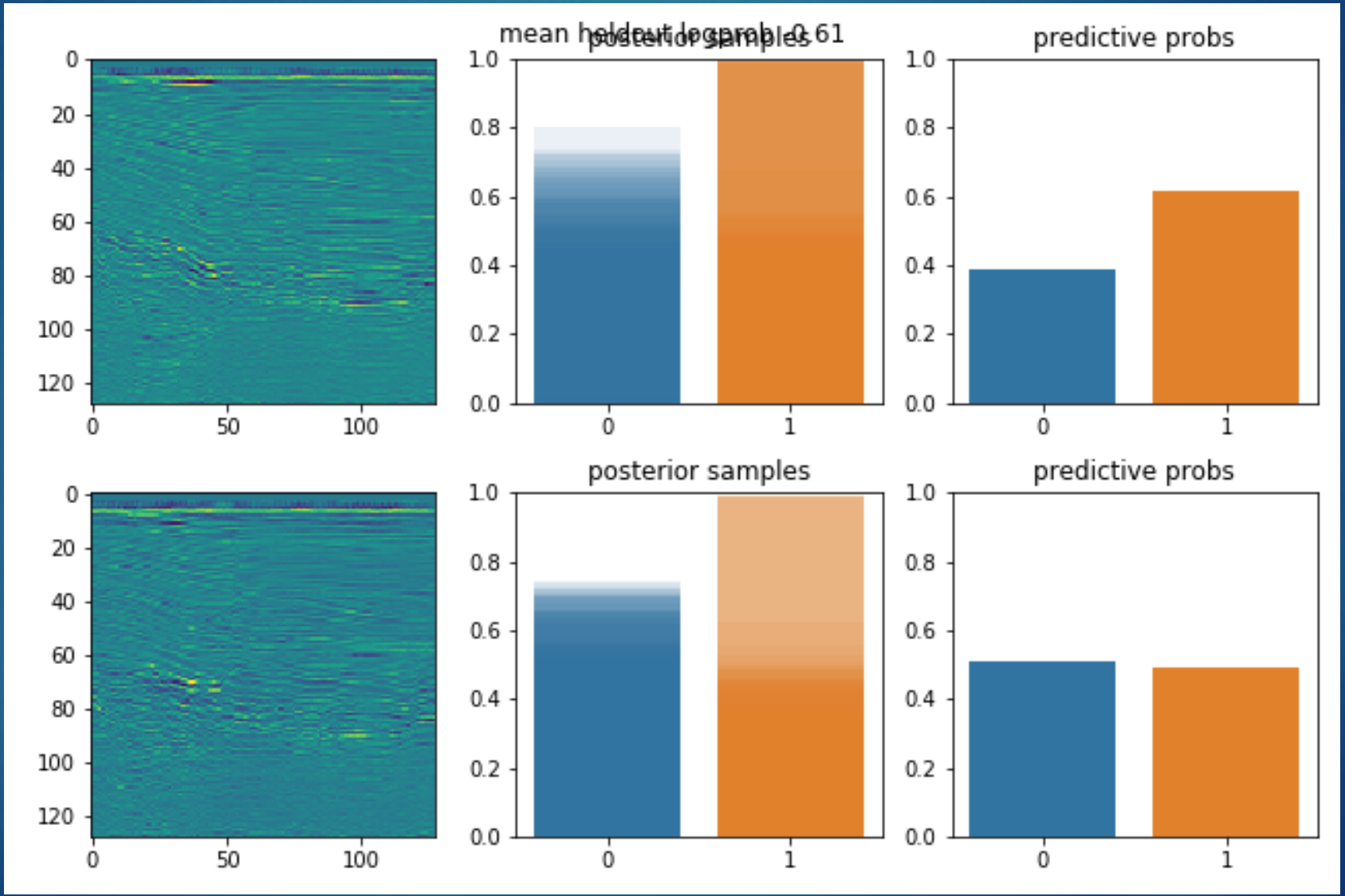
- Uncertainty measurement through posterior probability
- Particularly useful when class probabilities are close to each other



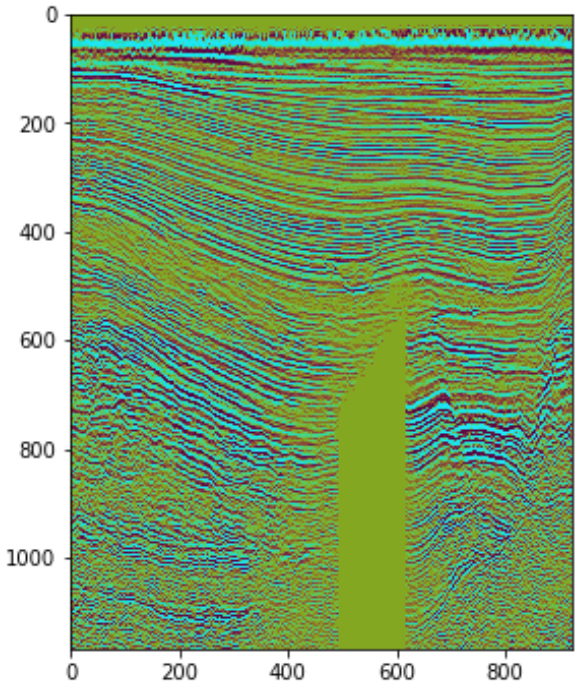
Bayes CNN uncertainty estimate

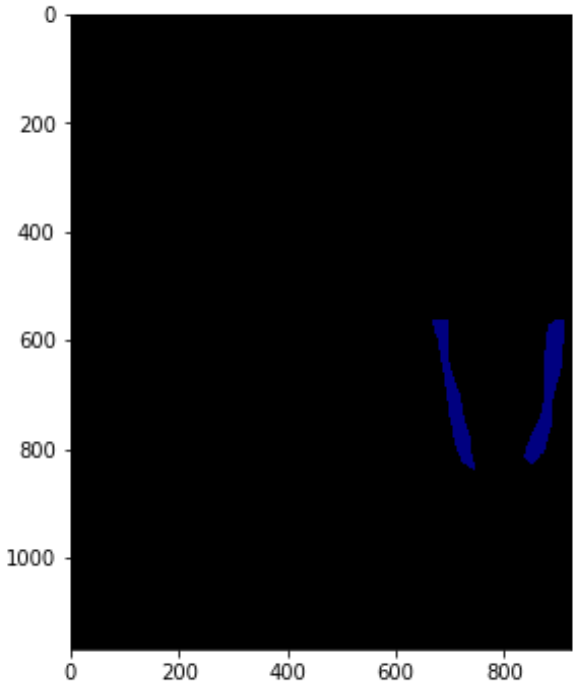


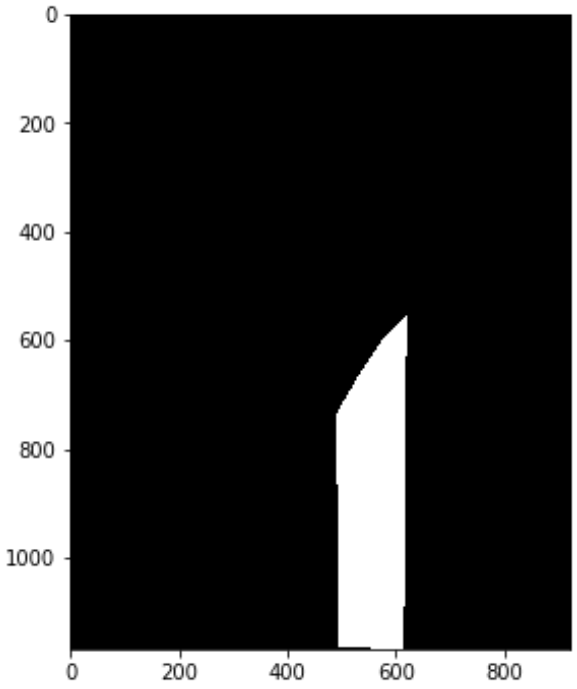
Bayes CNN uncertainty estimate

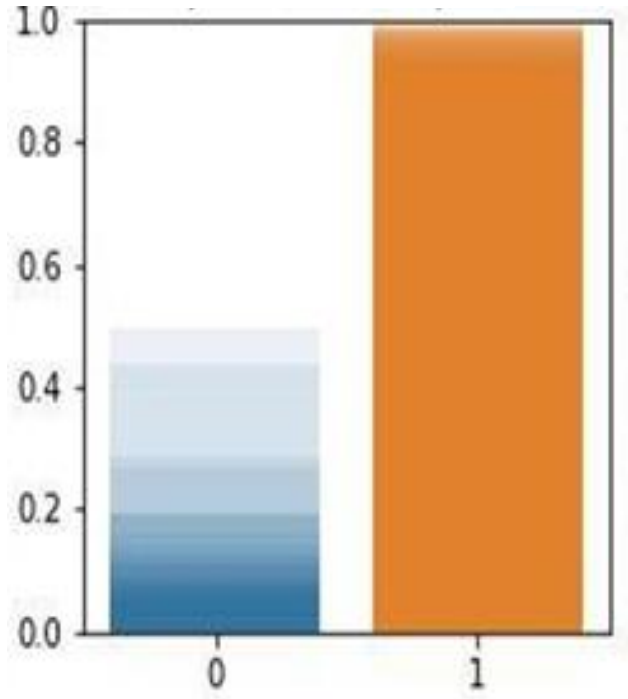


Results – 5245_xlines

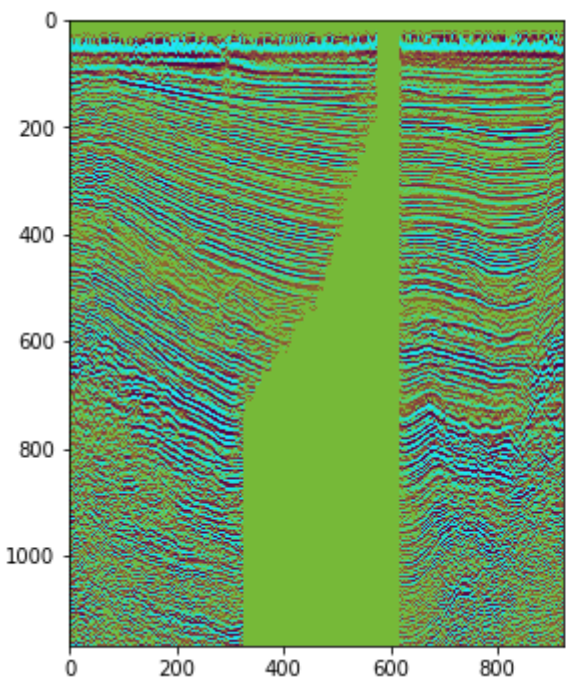


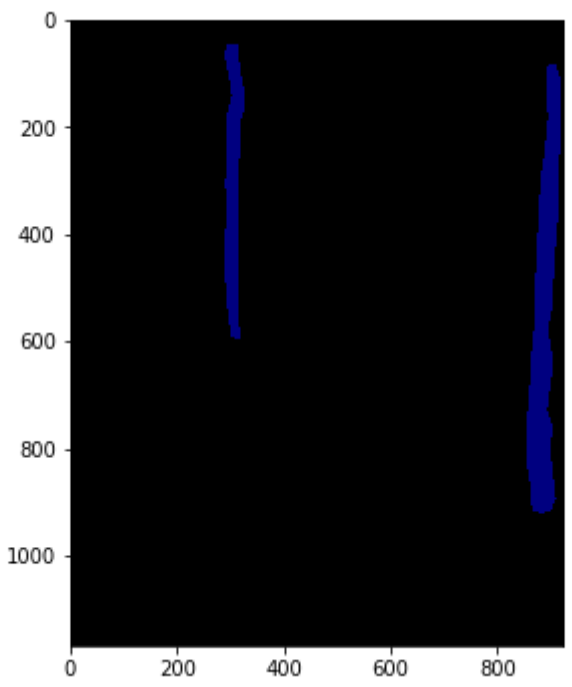


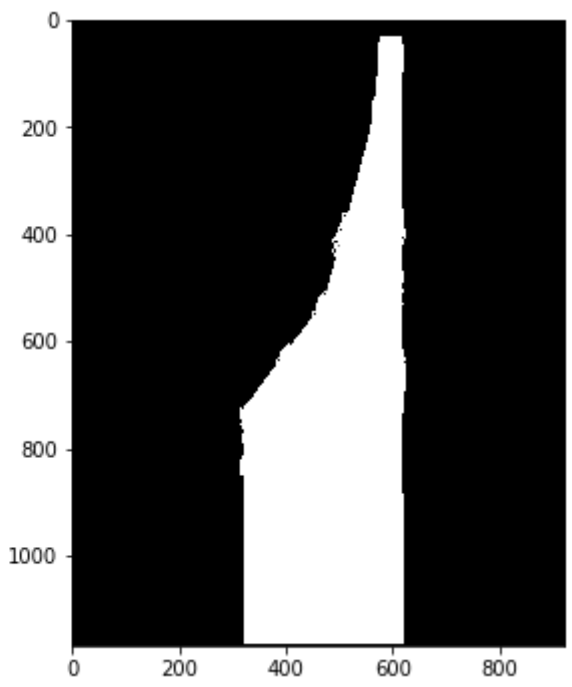


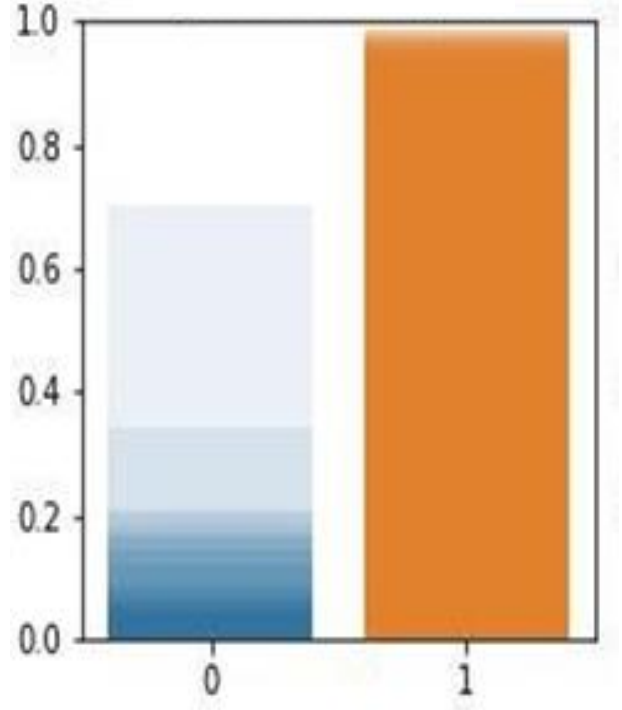


Results – 5325_xlines









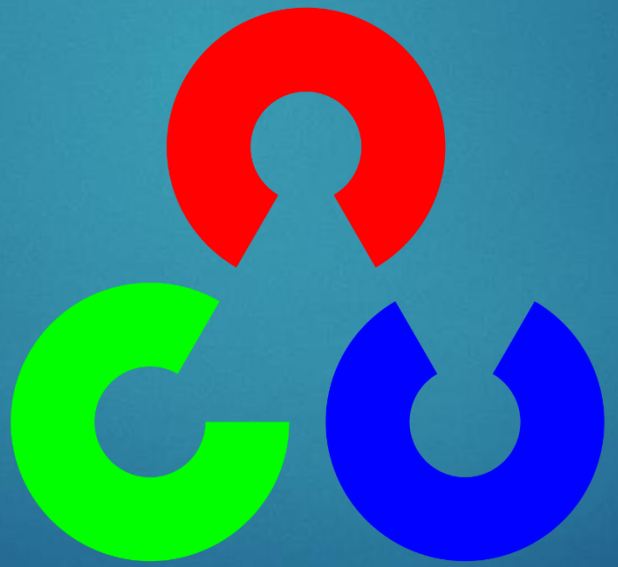
What next?

Further steps for Production-level software development

- Proper dataset mark-up by geophysicists with cross-check (1000+ images) and making it **open source**
- Testing of other SOTA CNN architectures
- (Optional) Fine-tuning NN architecture
- UX implementation with feedback from real users

Technology stack

python



OpenCV

JavaScript

Team

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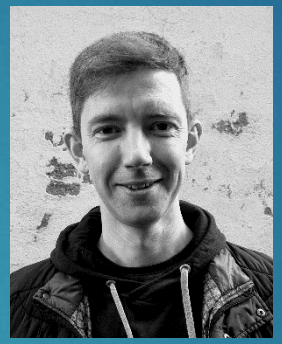
Business Development Manager, Data Scientist, JS Developer



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Thank you!

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