Proposed method

As usual, prepare posterior learning algorithm: $\{(\mathbf{x}^{(n)}, \mathbf{y}^{(n)})\}_{i=1}^{N}$

Instead of optimizing only network parameters:

$$\hat{\theta} = \arg\max_{\theta} \frac{1}{N} \sum_{n=1}^{N} \left(-\|f_\theta(\mathbf{x}^{(n)}; \bar{\mathbf{y}}^{(n)})\|_2^2 + \log \left| \det \mathbf{J}_{f_\theta} \right| \right).$$
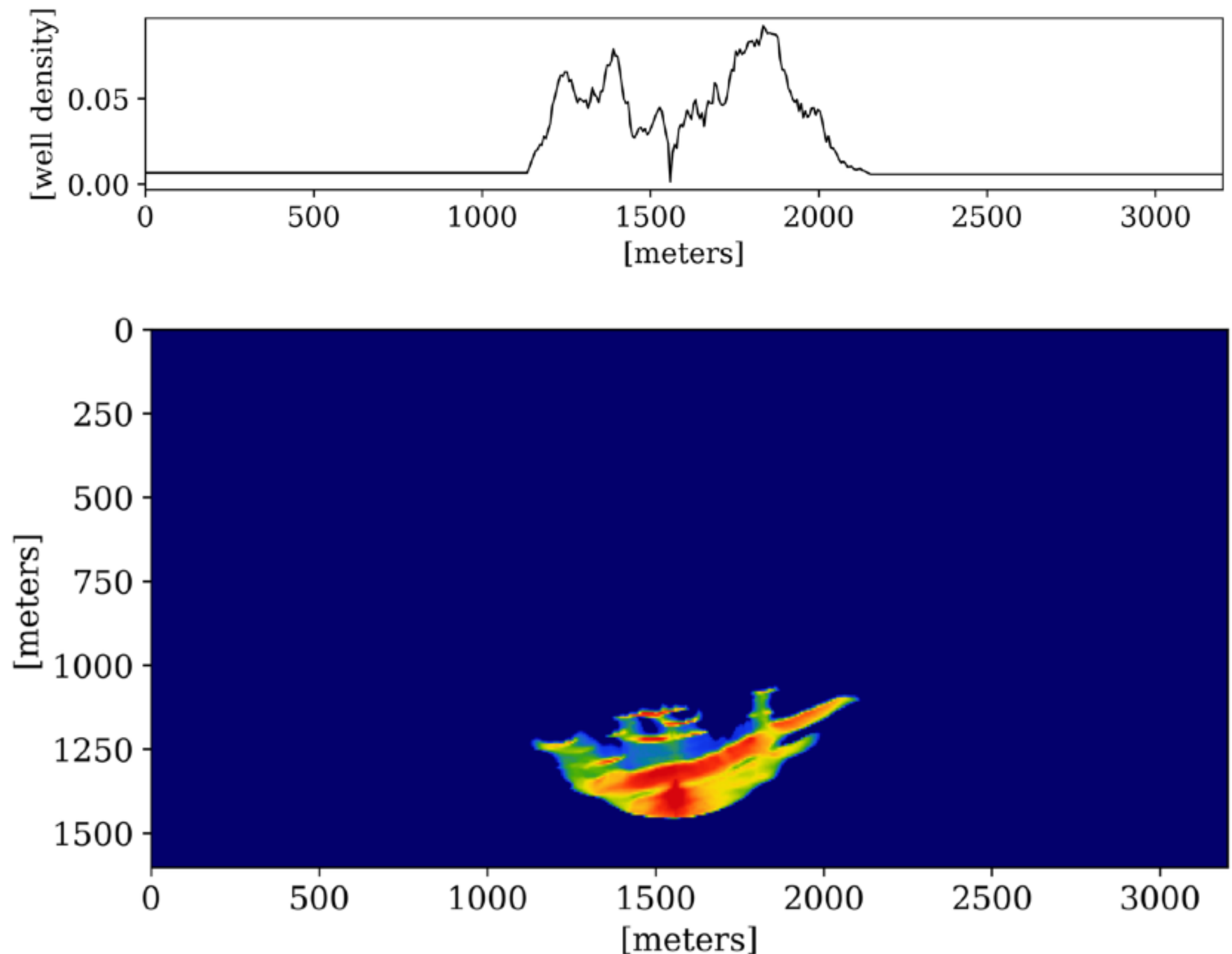
Jointly optimize experimental design in terms of **density**, $\mathbf{w}$, defining the mask $\mathbf{M}(\mathbf{w})$

$$\hat{\theta}, \hat{\mathbf{w}} = \arg\max_{\theta, \mathbf{w}} \frac{1}{N} \sum_{i=1}^{N} \left(-\|f_\theta(\mathbf{x}^{(n)}; (\mathbf{W}[\mathbf{w}] \odot \mathbf{x}^{(n)}, \bar{\mathbf{y}}^{(n)}))\|_2^2 + \log \left| \det \mathbf{J}_{f_\theta} \right| \right).$$

Optimal
well locations

Optimize for probability *density* of well placement

- ▶ well budget agnostic

- ▶ decide number of wells post-hoc

- ▶ easier optimization

- ▶ stochastic sampling during training avoids local minima

Wu, Sixue, Dirk J. Verschuur, and Gerrit Blacquière. "Automated seismic acquisition geometry design for optimized illumination at the target: A linearized approach." *IEEE Transactions on Geoscience and Remote Sensing* 60 (2021)

Bengio, Yoshua, Nicholas Léonard, and Aaron Courville. "Estimating or propagating gradients through stochastic neurons for conditional computation." *arXiv:1308.3432* (2013).