DOCTORAL CANDIDATE:	Anders U. Waldeland
DEGREE:	Philosophiae Doctor
FACULTY:	The Faculty of Mathematics and Natural Sciences
DEPARTMENT:	Department of Informatics
AREA OF EXPERTISE:	Seismic Image Analysis
SUPERVISORS:	Anne H. Schistad Solberg, Leiv-J. Gelius and Are Charles Jensen
DATE OF DISPUTATION:	2nd of March 2018
DISSERTATION TITLE:	*Seismic image analysis for applications related to iterative 3D velocity model building*

Can machine learning and image analysis be used to make seismic images faster?

Seismic images are one of our most important tools when trying to discover oil and gas reservoirs. These images are made by emitting sound waves into the subsurface earth. At transitions between different types of rocks, the waves are reflected back to the surface. If we know how fast the sound travels in the earth, we can determine where the reflection happened and make an image of the subsurface.
To make a velocity model is a time-consuming process due to heavy computer algorithms and large amount of required human interaction.

This thesis contributes by showing how methods from machine learning and image analysis can be used to speed up the velocity model building process. This is done in the two following ways:

> One of the time intensive steps is to obtain information about the shape of the different layers of rocks in the earth. This is normally done using extremely time consuming algorithms. We show that this can be done using image analysis. This reduces the needed computation time by a factor of 100.
>
> The other problem that is addressed in this thesis is related to interpretation of salt bodies. Salt bodies are large structures in the subsurface which must be accurately highlighted. This is normally done manually by geologists and requires tens of working hours. We use machine learning to make a semi-automatic salt interpretation algorithm. This makes it possible for the geologist to only highlight a small part of the salt body, and use the algorithm to do the rest.