Artificial Neural Networks for Geothermal Resource Assessment

```
Stephen Brown
Aprovechar Lab L3C
Montpelier, Vermont USA
```

Class 1 - Introduction

```
# Problem Setting

# Historical Approaches
```

Lab 1 - Installing Software and Datasets

Lab 2 - Dataset Contents and Preprocessing

Class 2 - Classification with Fully Connected Neural Networks

```
# Define a Supervised Learning Problem

# Mathematical Formulation

# Classification Problem

# Statistical Model

# Training the Neural Network

# Regularization of Network Training
```

Class 3 - Neural Network Architecture and Programming

```
# Architecture

# Implementation
```

Lab 3 - Running the Code

Class 4 - Modeling and Results

```
# Discussion of confidence in predictions

# Discussion of variability in predictions
```

Class 5. Variational Inference with Bayesian Neural Networks

```
# Paradigm

# Mathematical Formulation

# Training the Neural Network
```

Class 6. Variational Inference with Bayesian Neural Networks (continued)

```
# A Practical Approach - Variational Bayes

# Regularization of Network Training

# Interpretation of the Output
```

Class 7 - Bayesian Neural Network Architecture and Programming

```
# Architecture

# Implementation
```

Lab 4 - Running the Code

Class 8 - Modeling and Results

```
# Controlling the Model Complexity

# An Optimal Degree of Regularization

# Variability in Predictions

# Synopsis
```

Class 9 - Results of the Favored Model

```
# Review of Bayesian Neural Networks

# Distribution of Probabilities

# A Tool for Decision Makers

# Summary and TODOs
```

Extensions

Class 10 - Siamese Neural Networks for Site Similarity

```
# Concepts and Implementation
```

Lab 5 - Running the Code

Class 11 - Gaussian Processes Regression for Feature Engineering

```
# Concepts and Implementation
```

Class 12 - Gaussian Processes Regression for Feature Engineering (continued)

```
# Concepts and Implementation
```

Lab 6 - Running the Code