Applied Deep Learning

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Hyperparameter tuning – HParams

Hyperparameter tuning process with TensorBoard HParams plugin

1. Define the hyperparameter space

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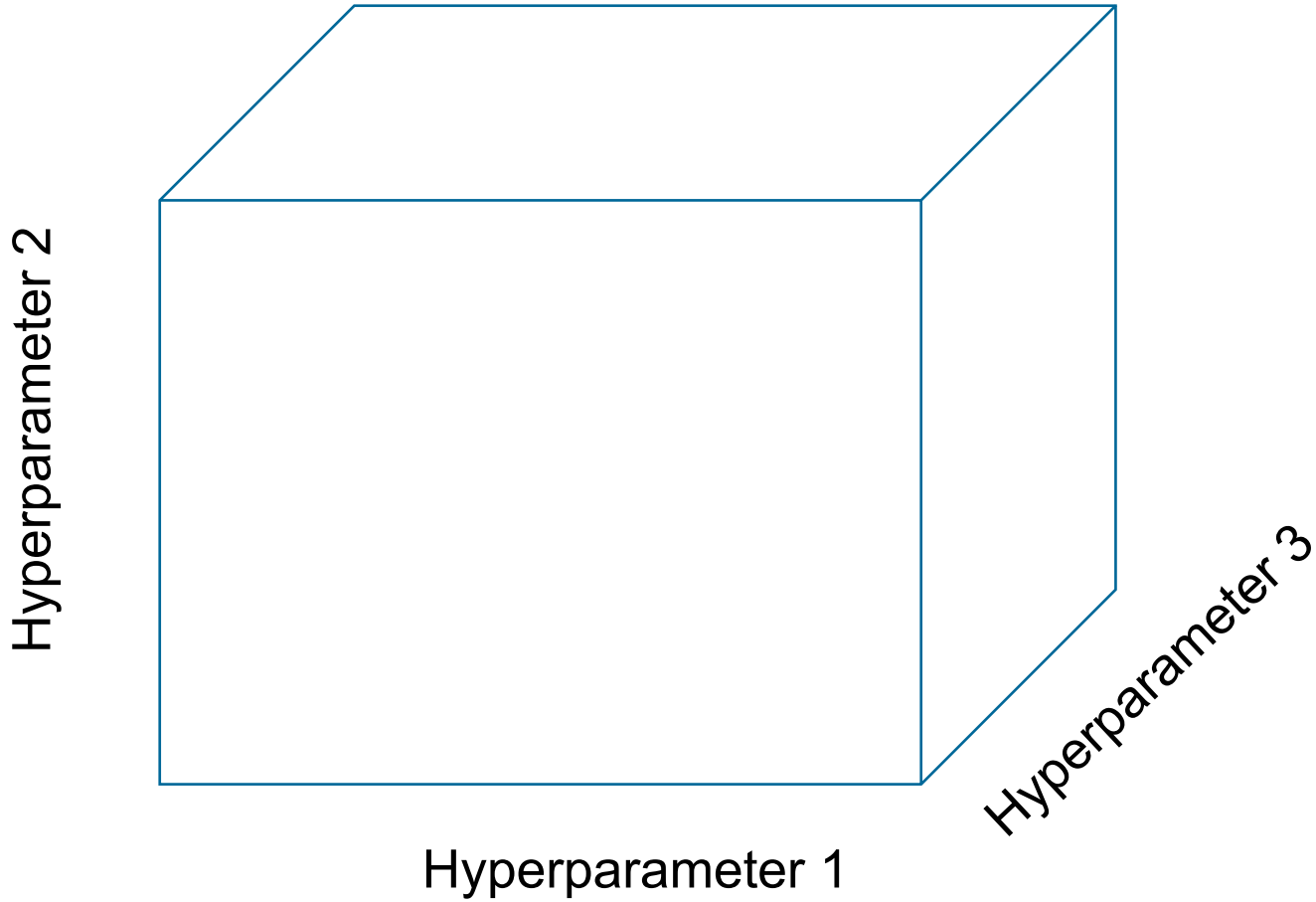
Hyperparameter space



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Hyperparameter tuning process with TensorBoard HParams plugin

1. Define the hyperparameter space

2. Define how to keep track of our runs

3. Define a function that, given a set of hyperparameters, trains and evaluates a model, then logs it

    Always evaluate on the validation set!

1. Create a set of hyperparameters at random and run the above function with that

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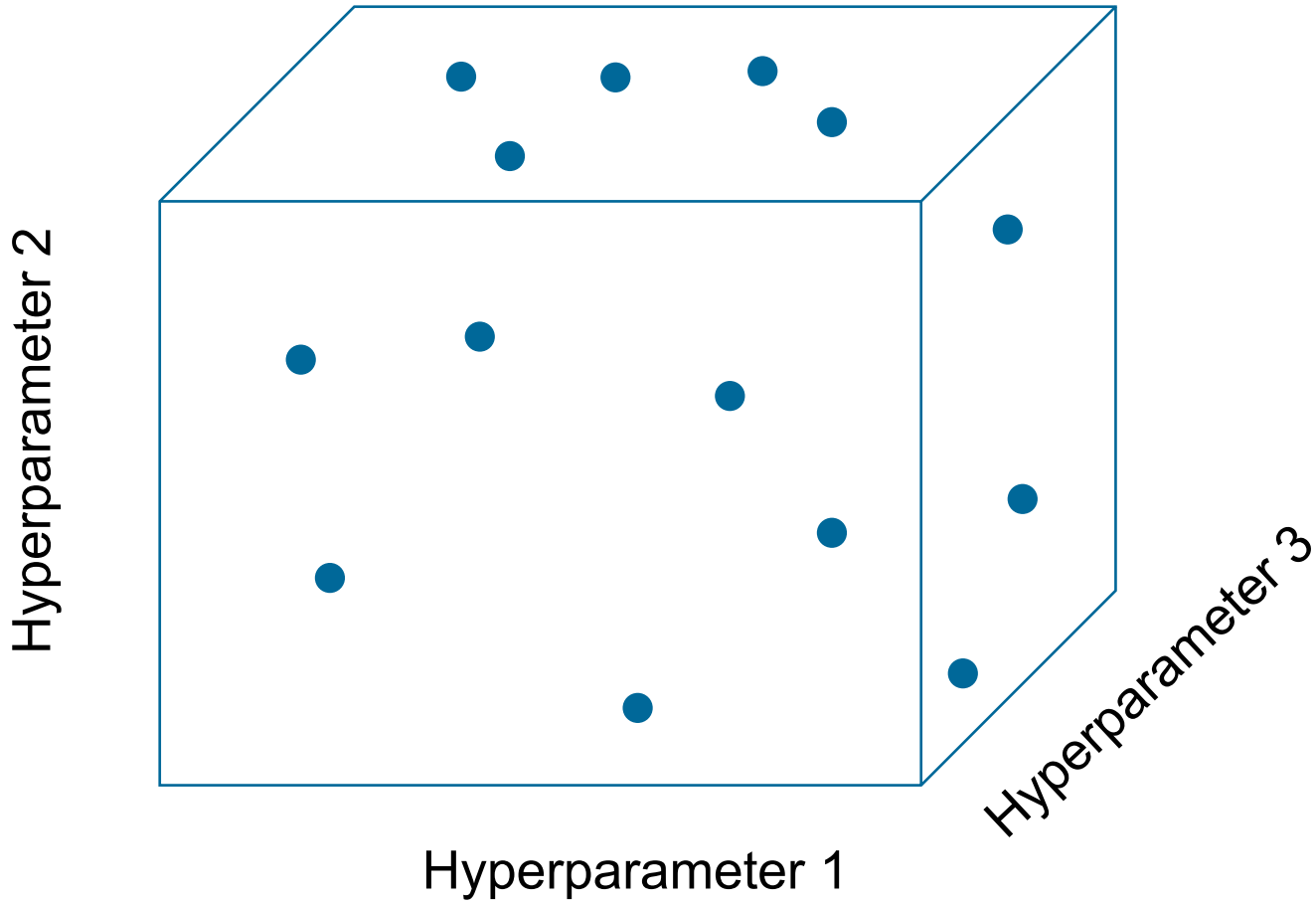
Hyperparameter space



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3. Define a function that, given a set of hyperparameters, trains and evaluates a model, then logs it
   Always evaluate on the validation set!

4. Create a set of hyperparameters at random and run the above function with that

5. Look at the outcome, possibly search in a smaller grid

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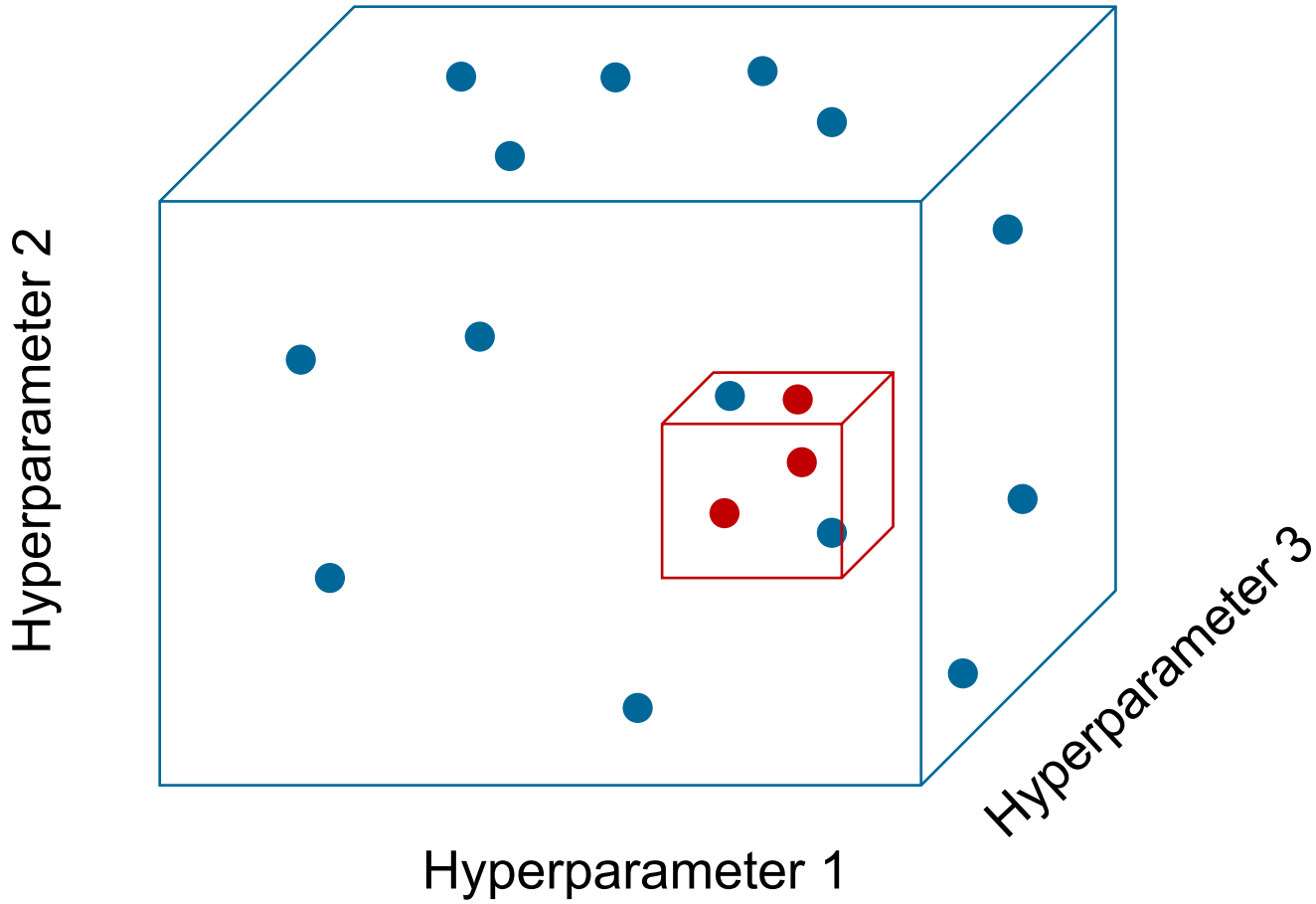
Hyperparameter space



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5. Look at the outcome, possibly search in a smaller grid

6. Evaluate your final model choice (on the test set)

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Hyperparameter tuning – Keras Tuner

Hyperparameter tuning process with Keras Tuner

1. Define a function that, given a hyperparameter-setter, creates a model
   Within that function, using the hyperparameter-setter, we define the hyperparameter space

2. Define an instance of the Keras Tuner, specifying the type of hyperparameter search
   Can use RandomSearch, **Hyperband**, Sklearn, BayesianOptimization

3. Let the tuner do its magic
   The hyperparameter-setter will automatically choose the “correct” hyperparameters

4. Based on the best parameters found, generate a model, train it, and evaluate it

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Autoencoders

What is an autoencoder

- A neural network that predicts its own inputs
  → So that we can learn a (compact) representation of the data

- The type of tasks we can use it for:
  - Dimensionality reduction (“advanced PCA”)
  - **Denoising: train to “recover” data, after artificial noise has been added**
  - Anomaly detection: train to represent normal data. When data cannot be predicted well, it is likely to be “anormal”
  - Generate new content (such as images): variational autoencoders

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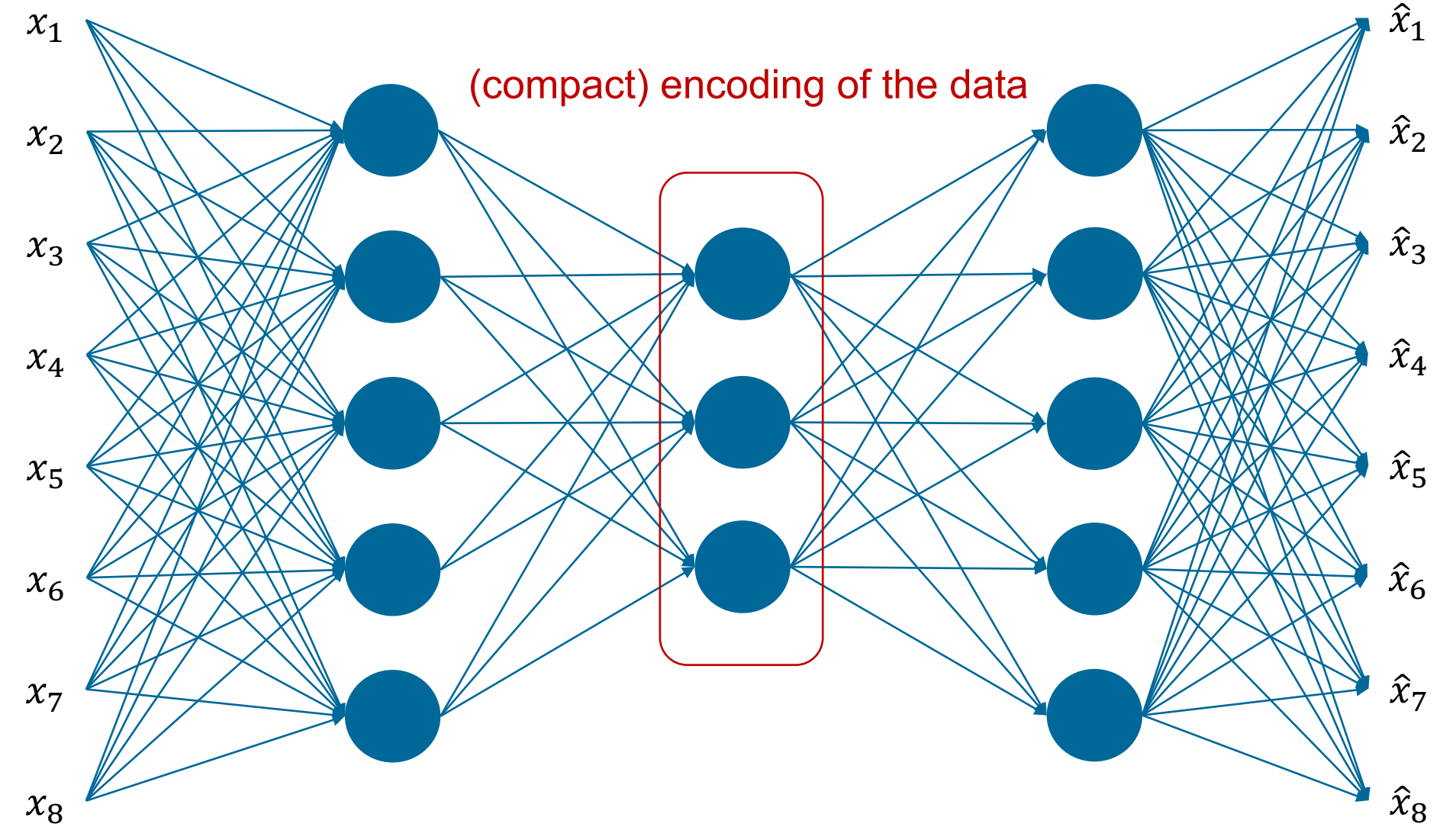
The structure of an autoencoder



"Encoder": find a representation $f(x)$ "Decoder": unpack $x = g\big(f(x)\big)$

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The process for denoising

- We create artificial noise on our data

- We build an autoencoder that takes the noisy data as input, and tries to build an accurate representation of the original
  - To do so with images, we need convolutional layers. Don’t worry about how they work, we will get to them soon. You find all the code on using them in the notebook!
  - Training the autoencoder may take quite a bit of time!

- We then can run the autoencoder on new (noisy) data, to create non-noisy versions

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See you after reading week!