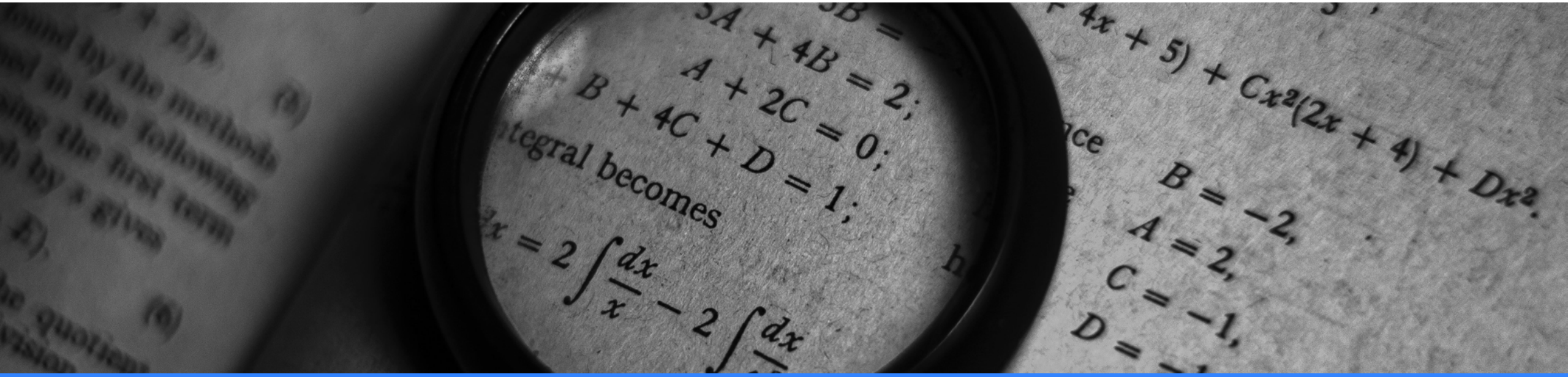

Practical Machine Learning

Hyperparameter Tuning

Sven Mayer

Hyperparameter Tuning

- Model structure
- Loss function
- Optimizer
- Learning Rate

- Dropout
- Batch Normalization

Random Search

- Time-consuming
- Not effective for large parameter spaces

Randomly testing all parameter.

- Use Case: Hyperspace exploration

Grid Search

- Traditional ML:
  - sklearn.model_selection.GridSearchCV

Grid Search is the search through a manually specified set of parameters.

- Time consuming
- Not effective for Deep NN due to the large parameter space
- “Partial” Grid Search can be effective

Trial and Error

Trial and Error is a search in which new hyperparameters are tested until a "good" model is found. The hyperparameters are picked by analyzing the failed runs.

- Common approach for deep NN
- The initial seed can be random or based on prior knowledge

Network Growing and Network Pruning

Network Growing and Network Pruning is used to determine how man hidden neurons are “optimal.” For Starting with a small model and adding neurons until the good solution is found.

- Network Growing
  - Less Time-Intensive
  - Smaller molds
- Network Pruning
  - Time-Intensive
  - Large molds

Du, K. L., & Swamy, M. N. (2006). *Neural networks in a softcomputing framework*. Springer Science & Business Media.

Domain Knowledge Based Method

Limiting the search space by using prior knowledge helps especially in the early steps when still exporting the vast parameter space.

- What worked before?
- What worked for others?

Early Stopping

Stops training when no improvement happens over a certain period.

- Saves a lot of time
- `tf.keras.callbacks.EarlyStopping`

Conclusion

Hyperparameter Tuning

- Random Search
- Grid Search
- Trial and Error
- Network Growing and Network Pruning
- Domain Knowledge Based Method
- Early Stopping

- Combining different strategies
- Keep track of all trained models
- Parallel and sequential training

License