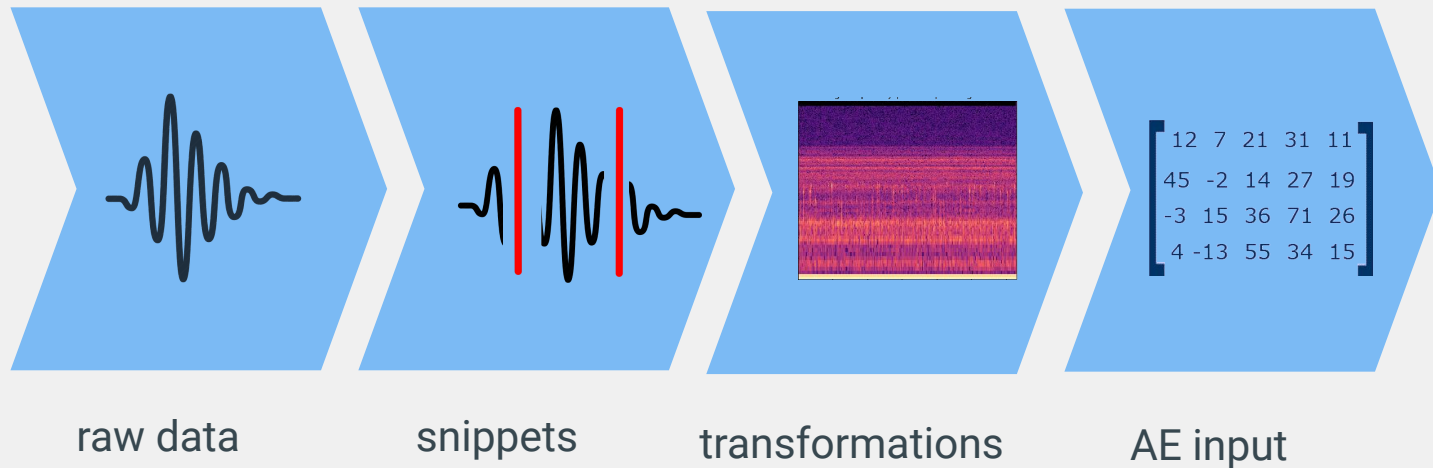


Gruppe A wie Anomalie

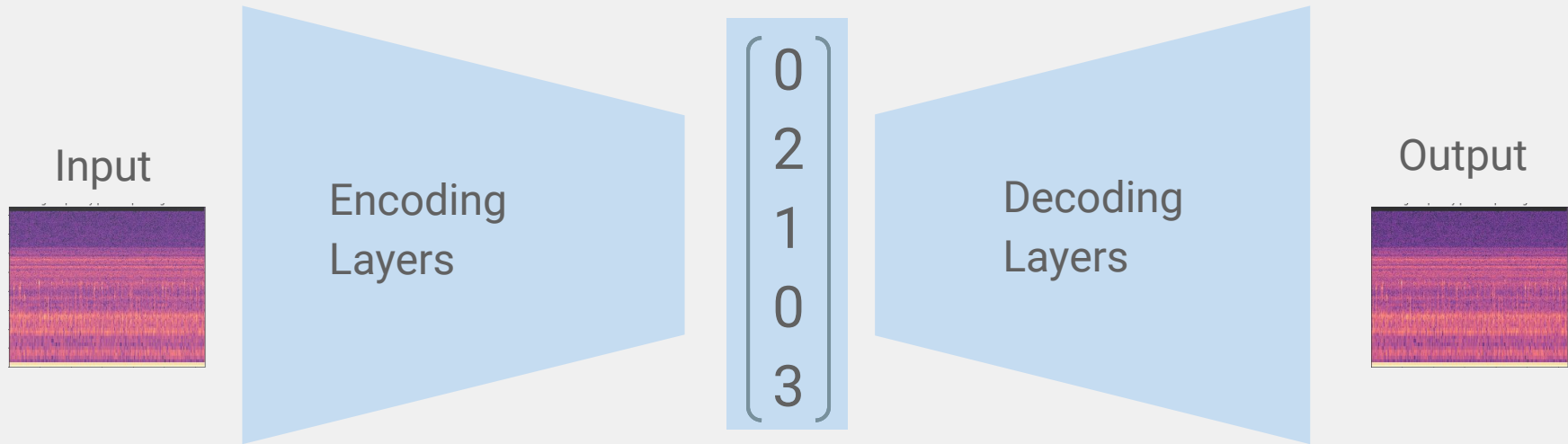
Erkennung und Lokalisierung von Leckstellen in Wassernetzen

Do Kim, Lisa Krombholz, Stefanie Kunze, Andrea Maldonado, Armela Meleqi, Magdalena Speer

Preprocessing Pipeline



Autoencoder Architekturen



Autoencoder Architekturen

Simple
Autoencoder

Einfache Dense-Layers

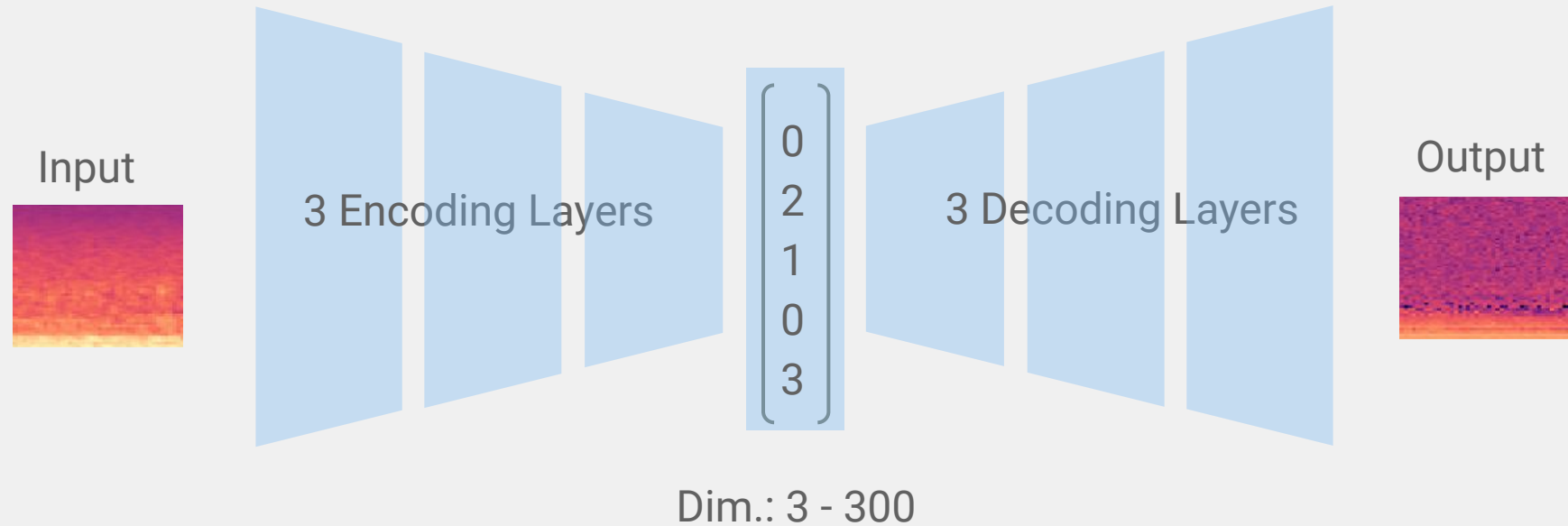
Convolutional
Autoencoder

Convolutions, Max Pooling,
Dense Layers

Variational
Autoencoder

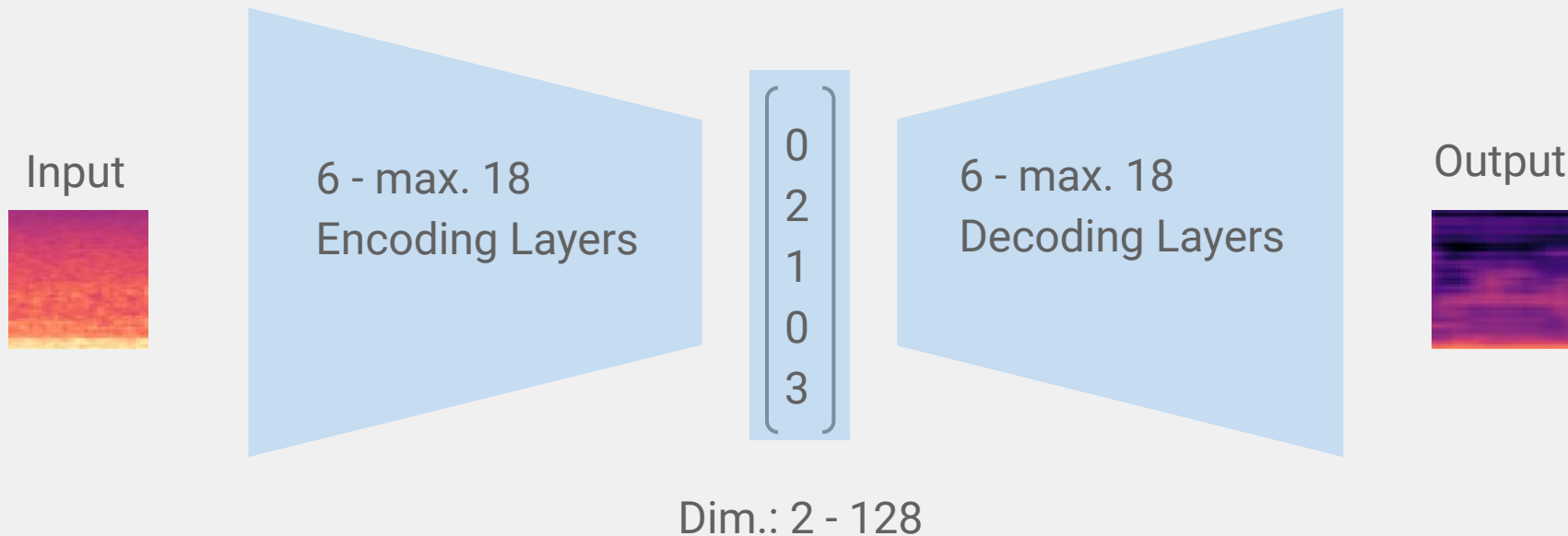
Lernt eine Verteilung der
Daten

Autoencoder Architekturen: Simple Autoencoder

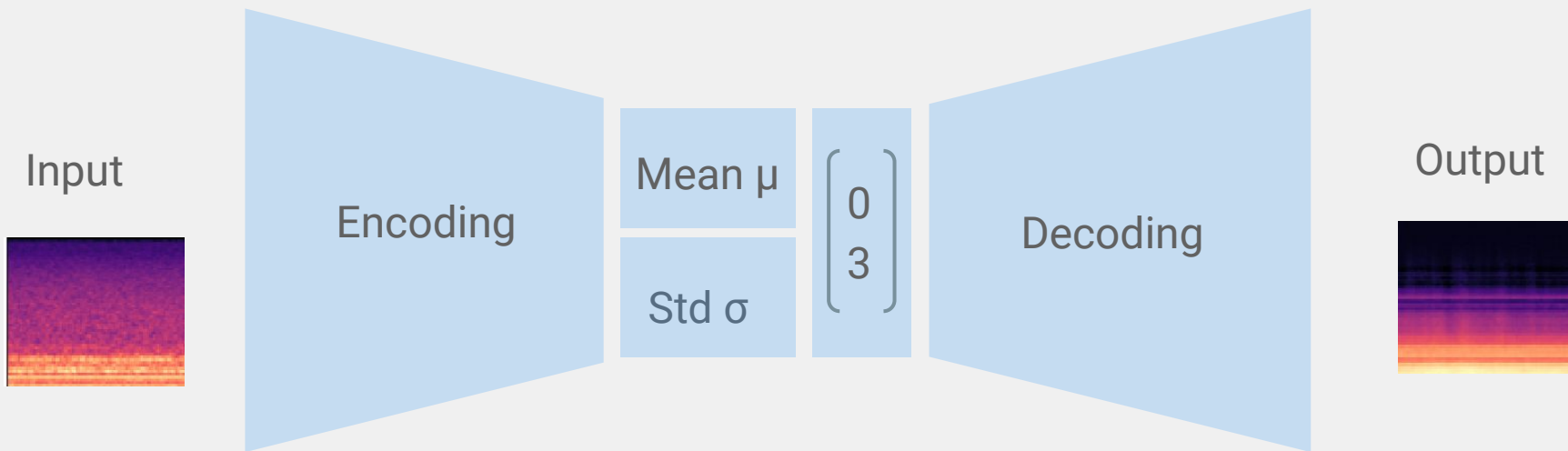


Nur Dense Layers

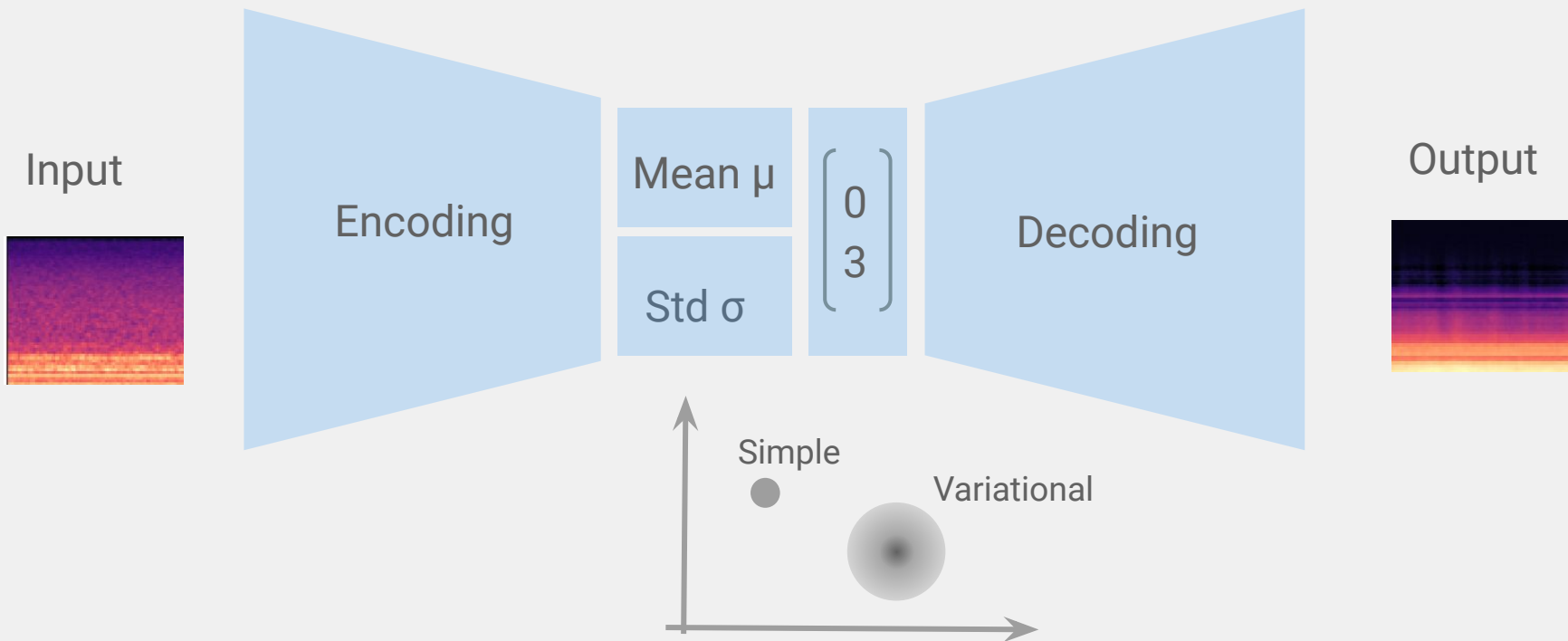
Autoencoder Architekturen: Convolutional Autoencoder



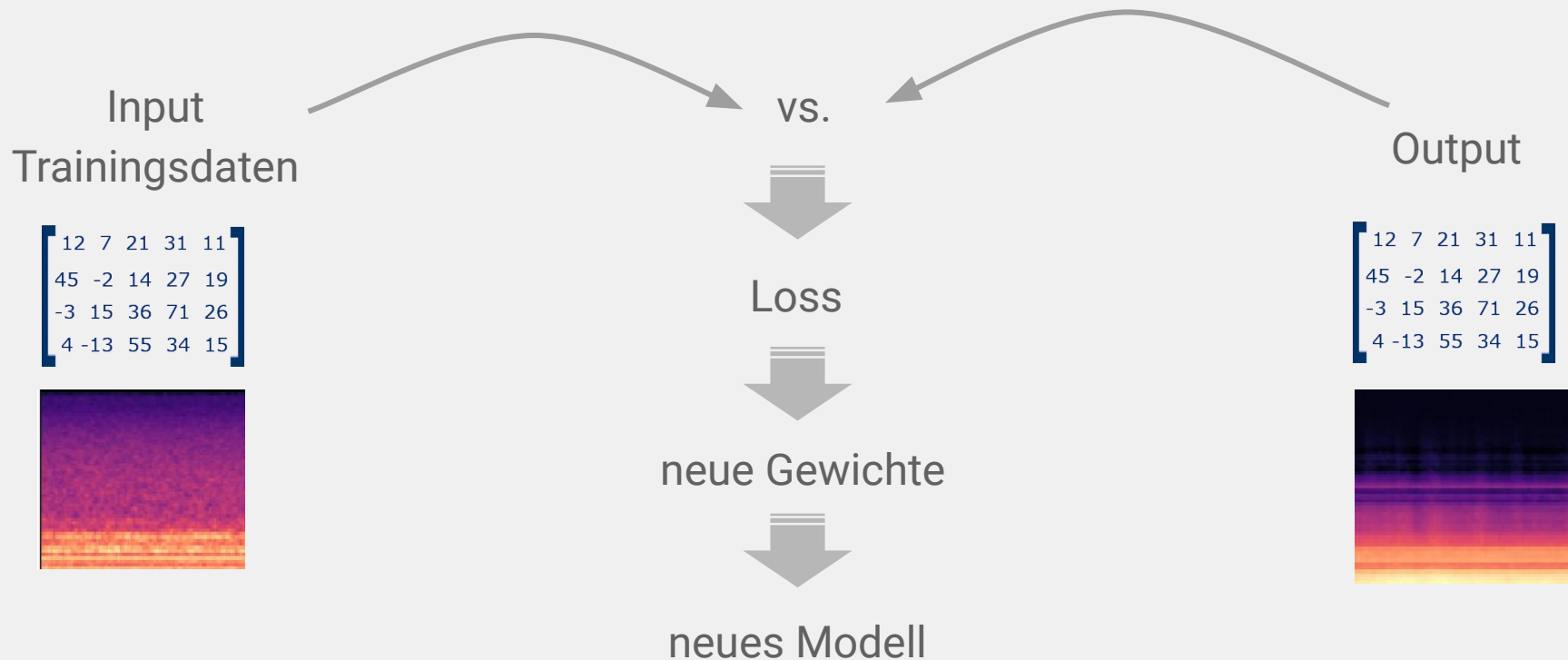
Autoencoder Architekturen: Variational Autoencoder



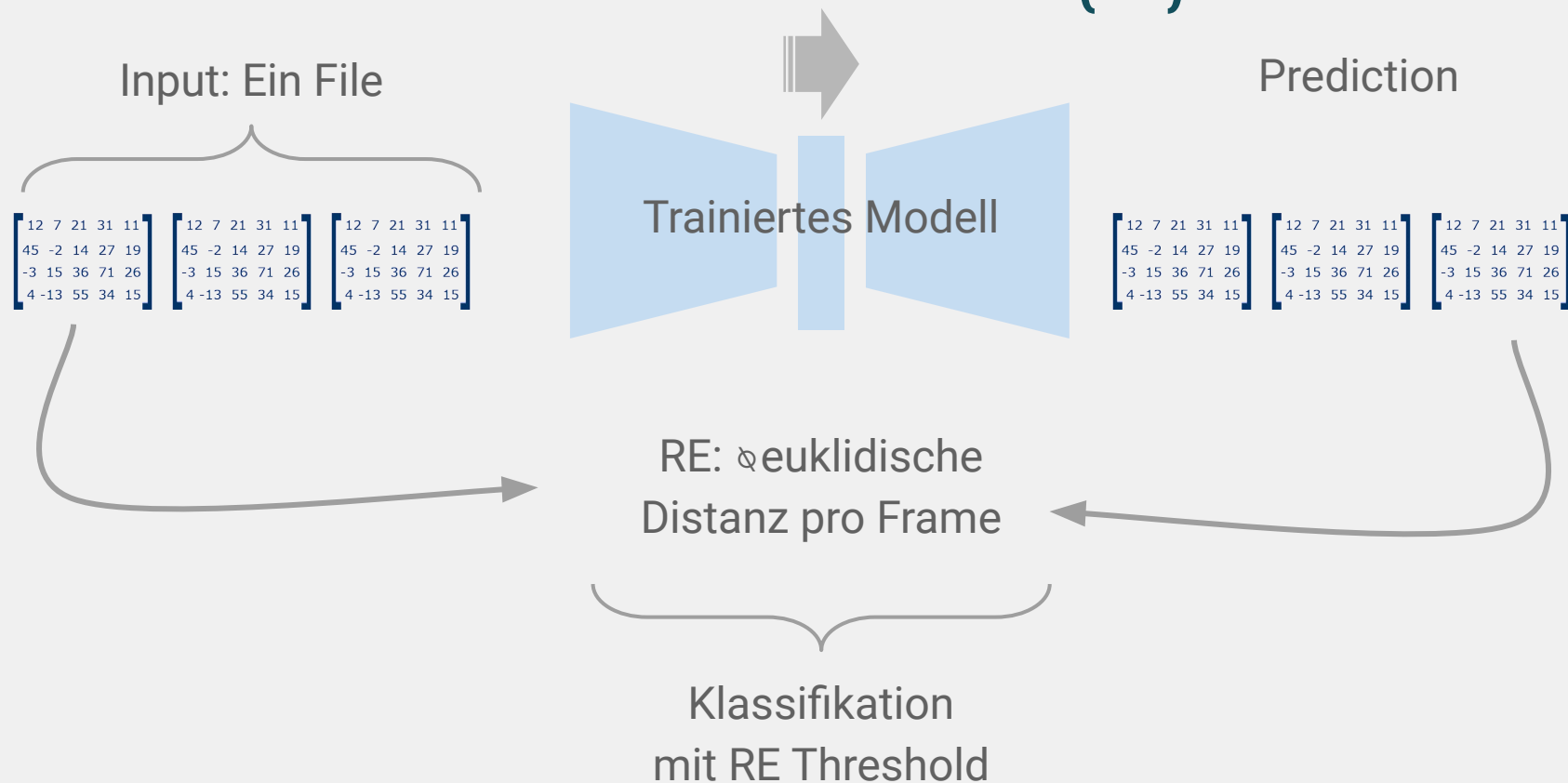
Autoencoder Architekturen: Variational Autoencoder



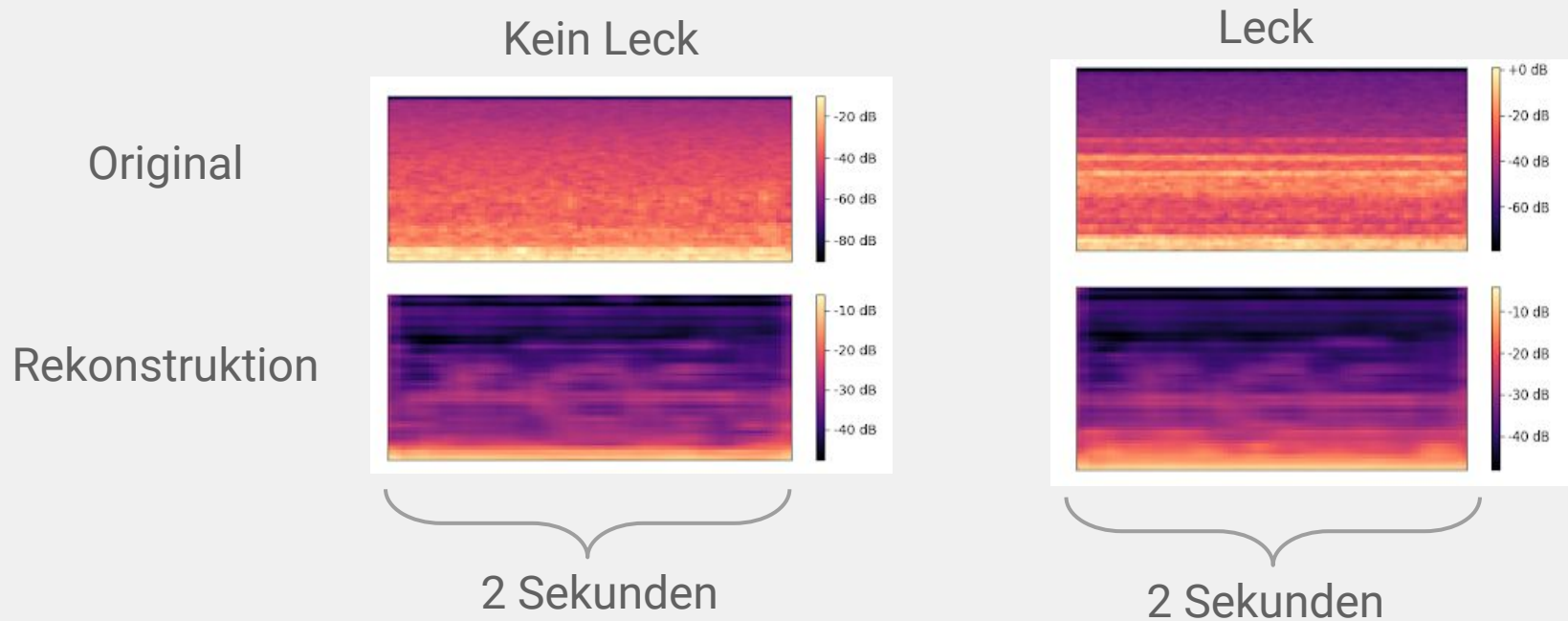
Autoencoder Architectures: Training



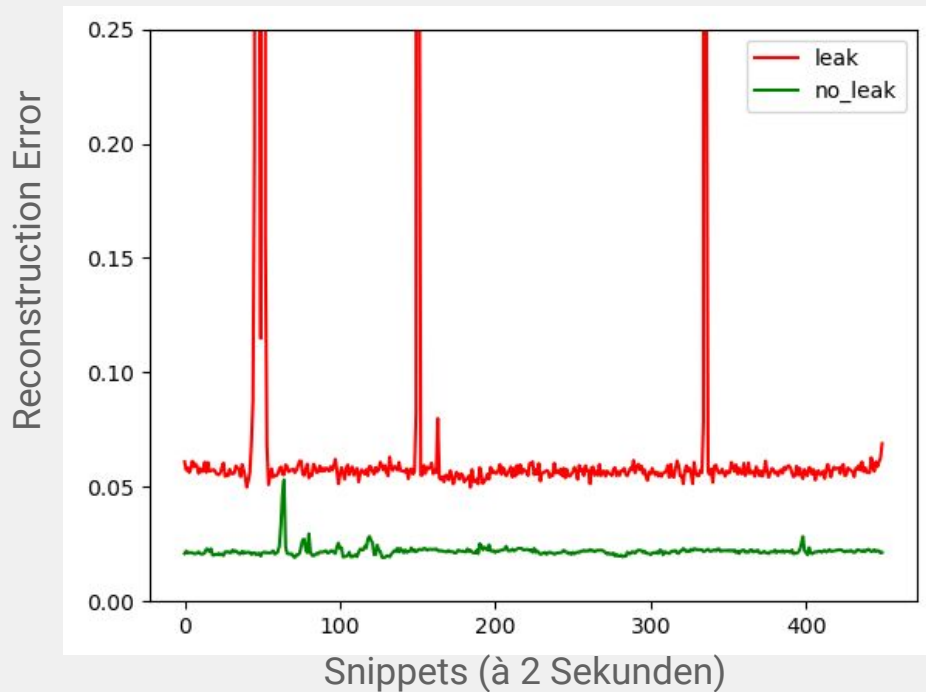
Data Classification: Reconstruction Error (RE)



Data Classification: Bspw. CNN AE



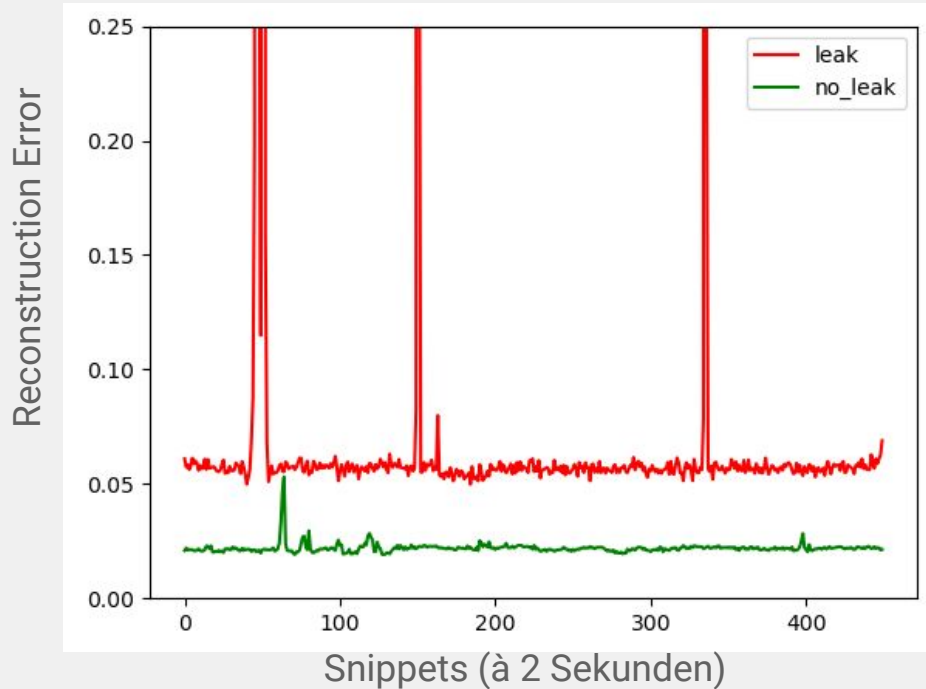
Data Classification: Reconstruction Error of Two Files



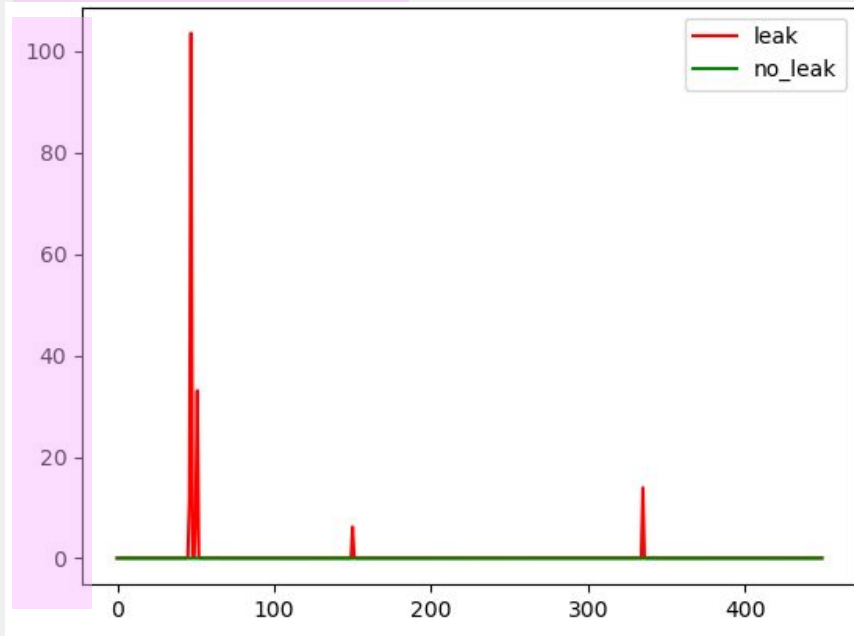
CNN-Autoencoder mit 6 Layers,
Encoding-Dim. 2,
30 Epochen lang trainiert

Jeweils eine Beispiel-Audiodatei mit
Leck (rot) vs. eine ohne Leck (grün)

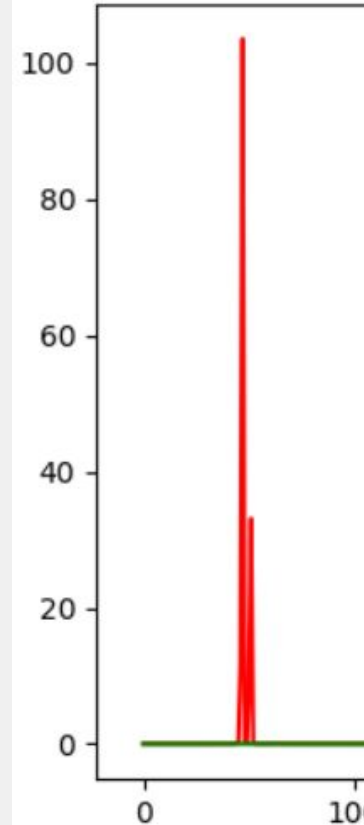
Data Classification: Reconstruction Error



Zoom-out an y-Achse:

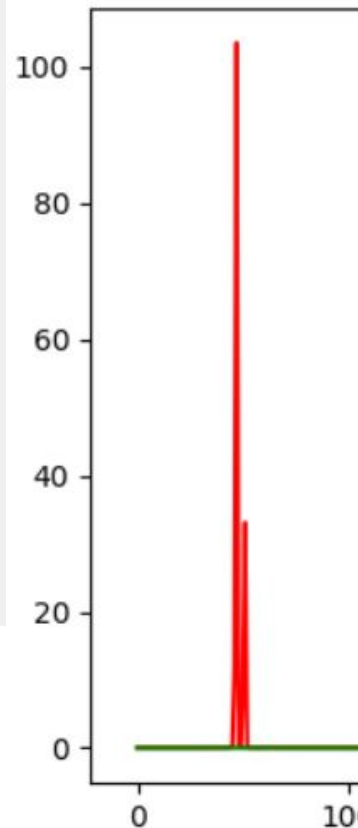
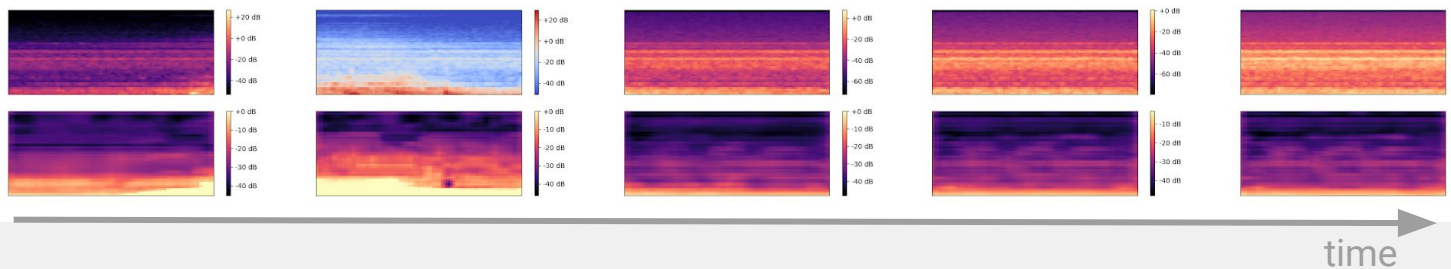
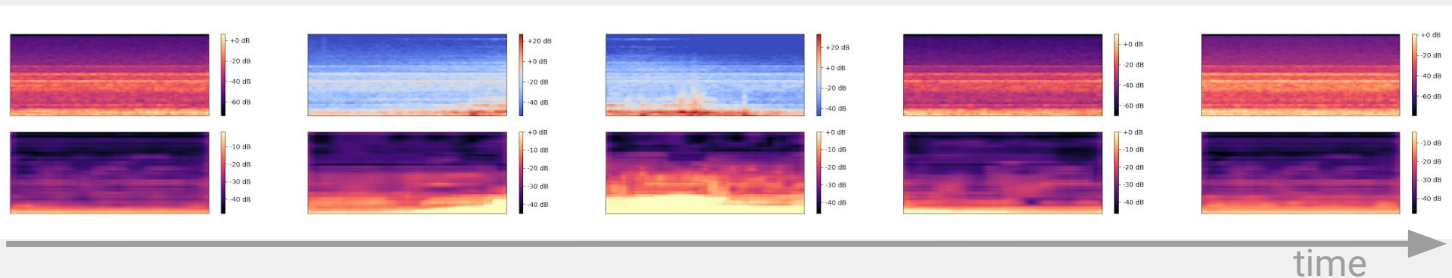


Data Classification: Reconstruction Error



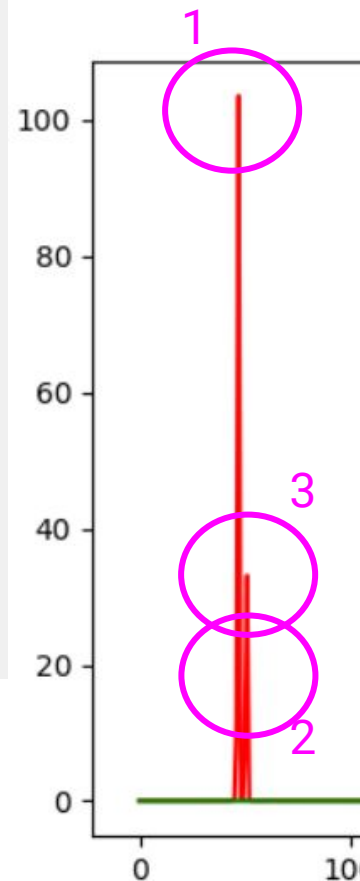
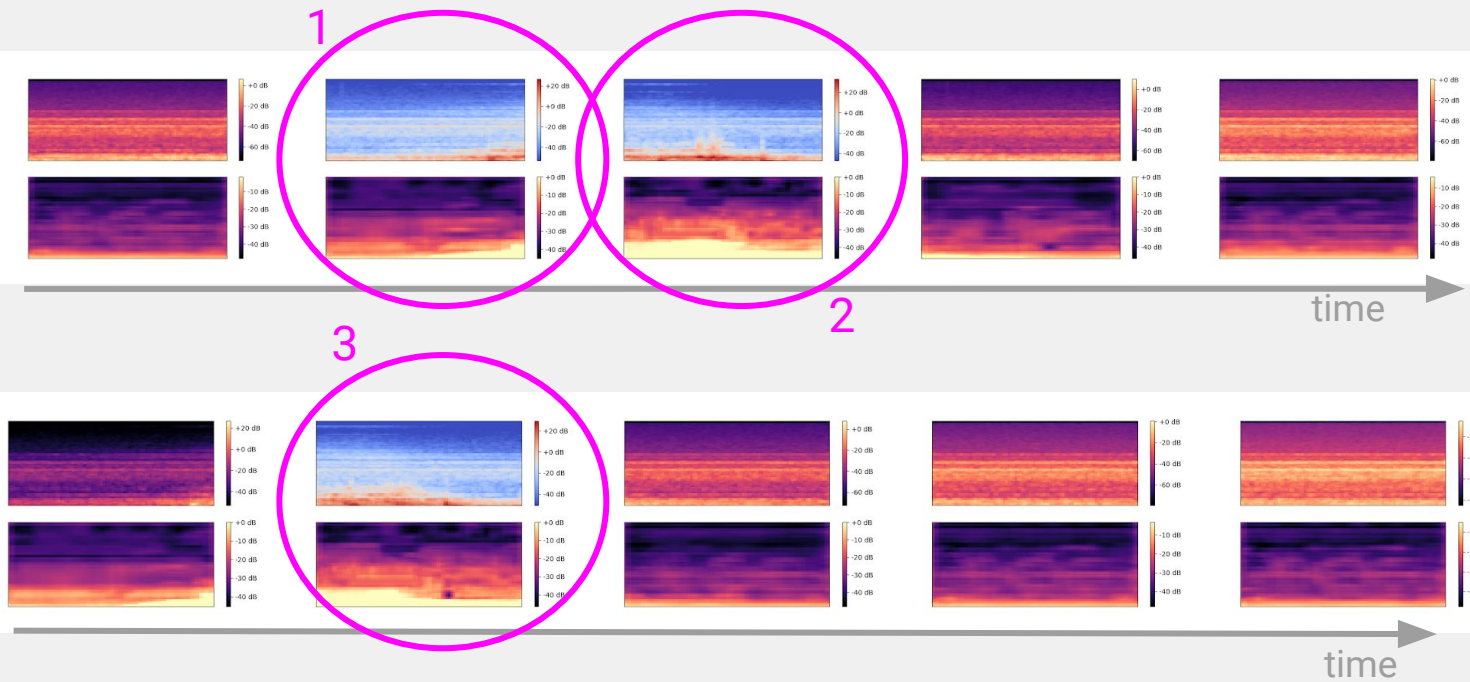
Data Classification: Reconstruction Error

Leck-Spektrogramme der Snippets: Input (o.) vs. Prediction (u.)

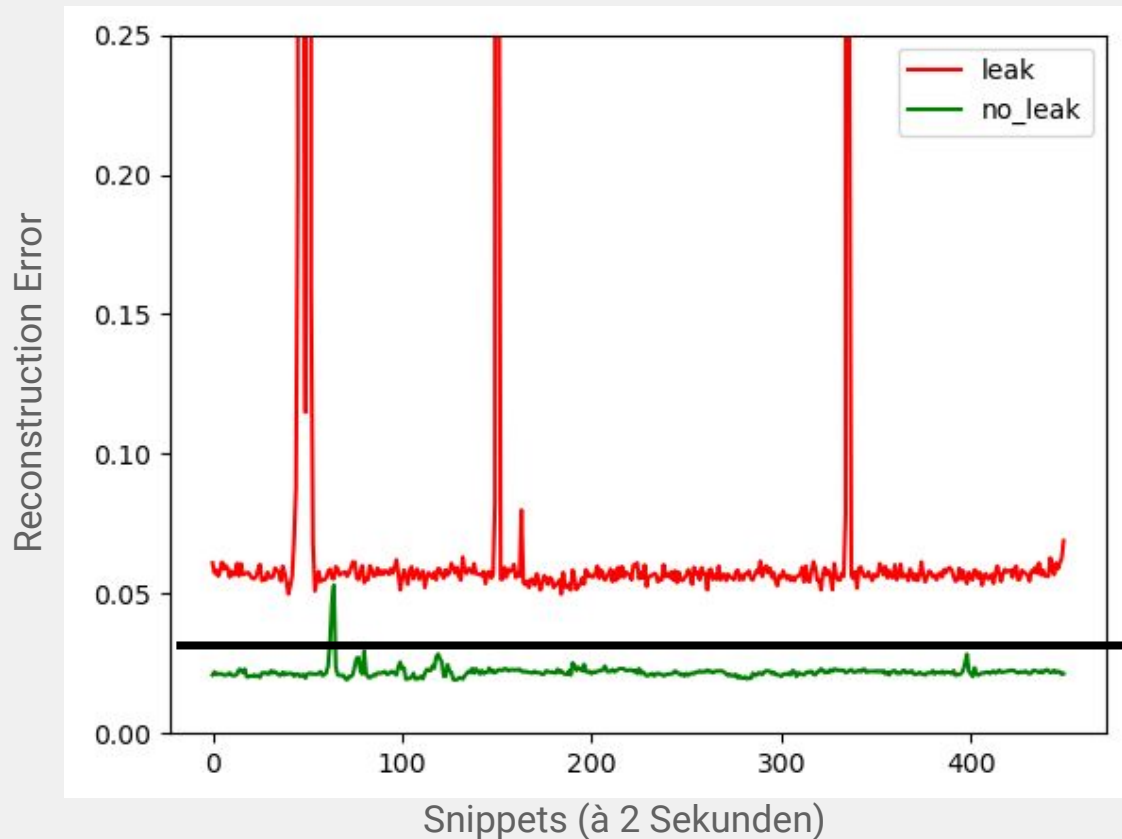


Data Classification: Reconstruction Error

Leck-Spektrogramme der Snippets: Input (o.) vs. Prediction (u.)

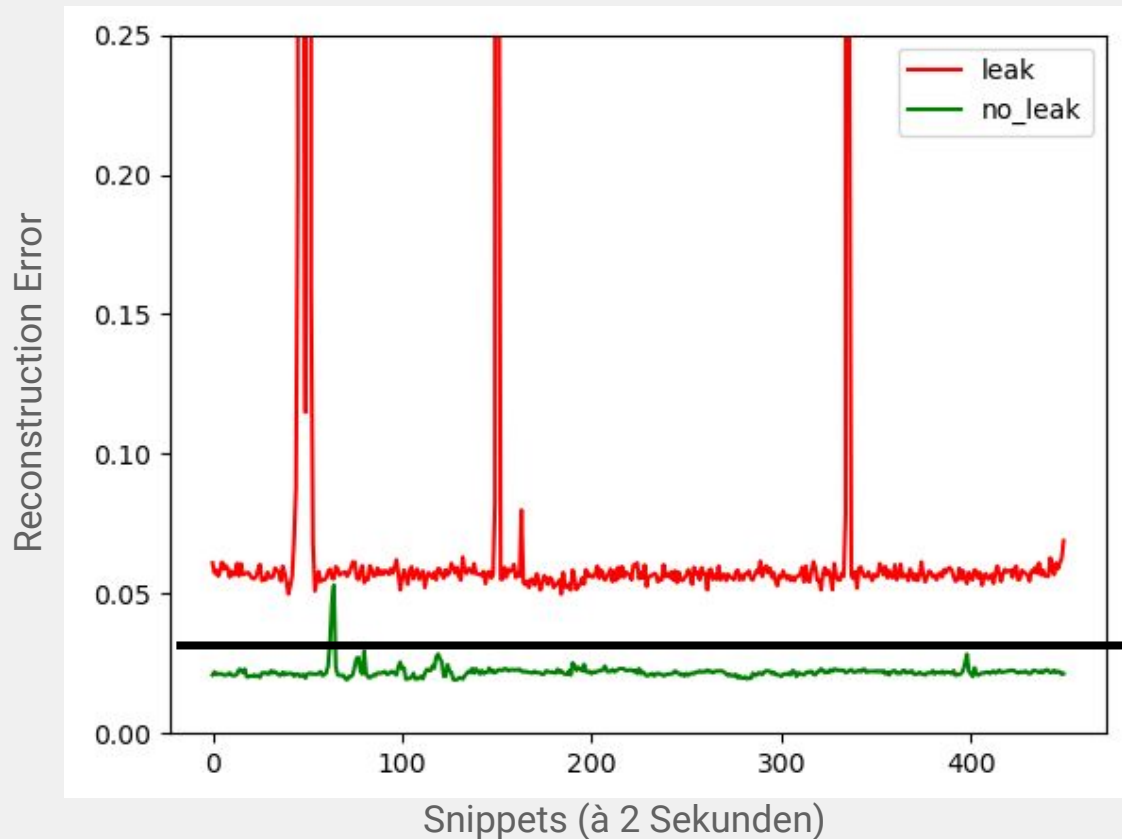


Classification with Threshold



Bsp. für Threshold:
Mean + Std
von Leak data

Classification with Threshold



Leak

Bsp. für Threshold:
Mean + Std
von Leak data



Kein Leak

Classification with Threshold

$$\begin{bmatrix} 12 & 7 & 21 & 31 & 11 \\ 45 & -2 & 14 & 27 & 19 \\ -3 & 15 & 36 & 71 & 26 \\ 4 & -13 & 55 & 34 & 15 \end{bmatrix}$$


3.425

$$\begin{bmatrix} 12 & 7 & 21 & 31 & 11 \\ 45 & -2 & 14 & 27 & 19 \\ -3 & 15 & 36 & 71 & 26 \\ 4 & -13 & 55 & 34 & 15 \end{bmatrix}$$


6.671

$$\begin{bmatrix} 12 & 7 & 21 & 31 & 11 \\ 45 & -2 & 14 & 27 & 19 \\ -3 & 15 & 36 & 71 & 26 \\ 4 & -13 & 55 & 34 & 15 \end{bmatrix}$$


7.425

Input file
in snippets

Reconstruction
errors

Classification with Threshold

12	7	21	31	11
45	-2	14	27	19
-3	15	36	71	26
4	-13	55	34	15



3.425



0

12	7	21	31	11
45	-2	14	27	19
-3	15	36	71	26
4	-13	55	34	15



6.671



1

12	7	21	31	11
45	-2	14	27	19
-3	15	36	71	26
4	-13	55	34	15



7.425



1

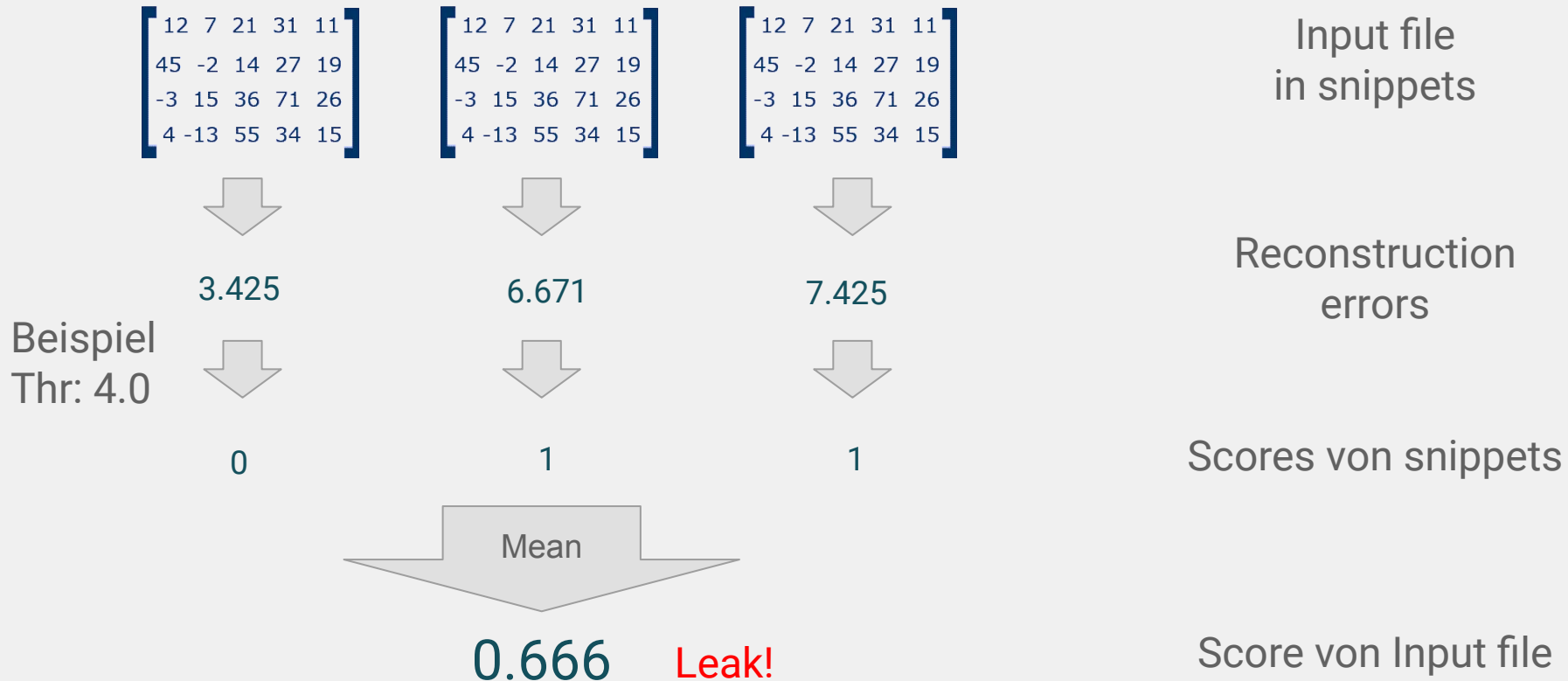
Input File
in snippets

Reconstruction
Errors

Scores von Snippets

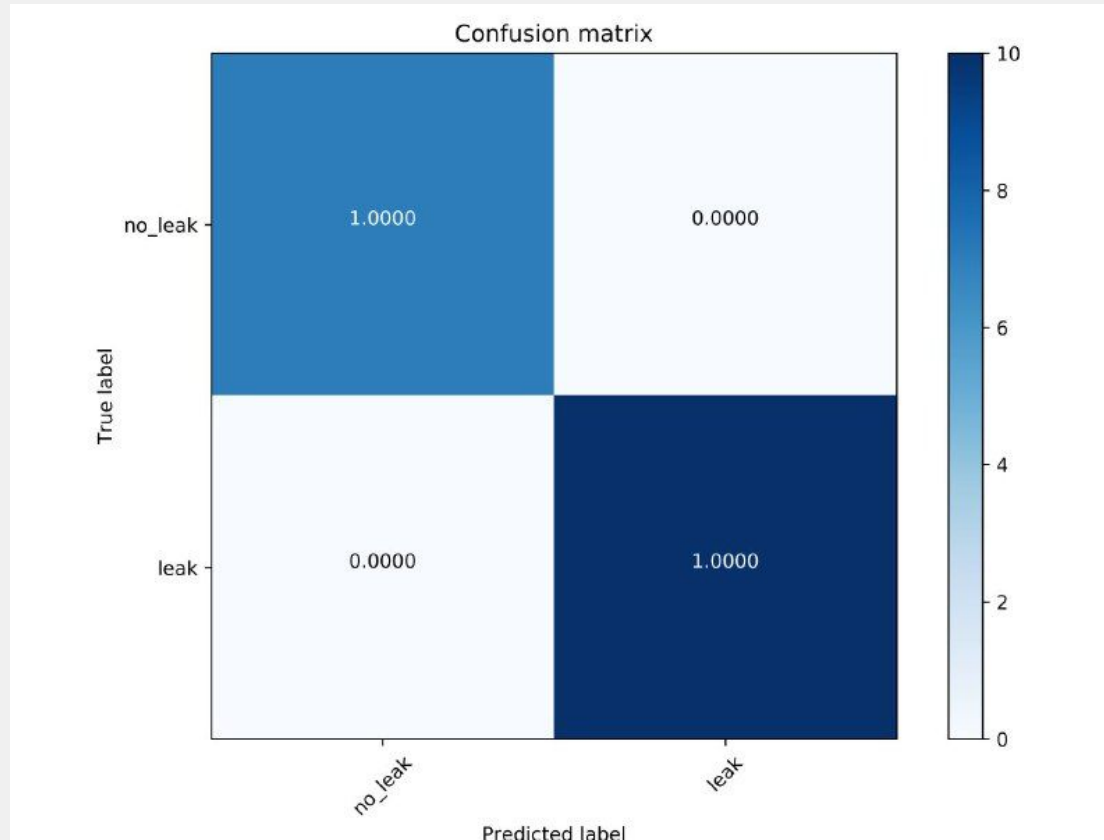
Beispiel
Thr: 4.0

Classification with Threshold



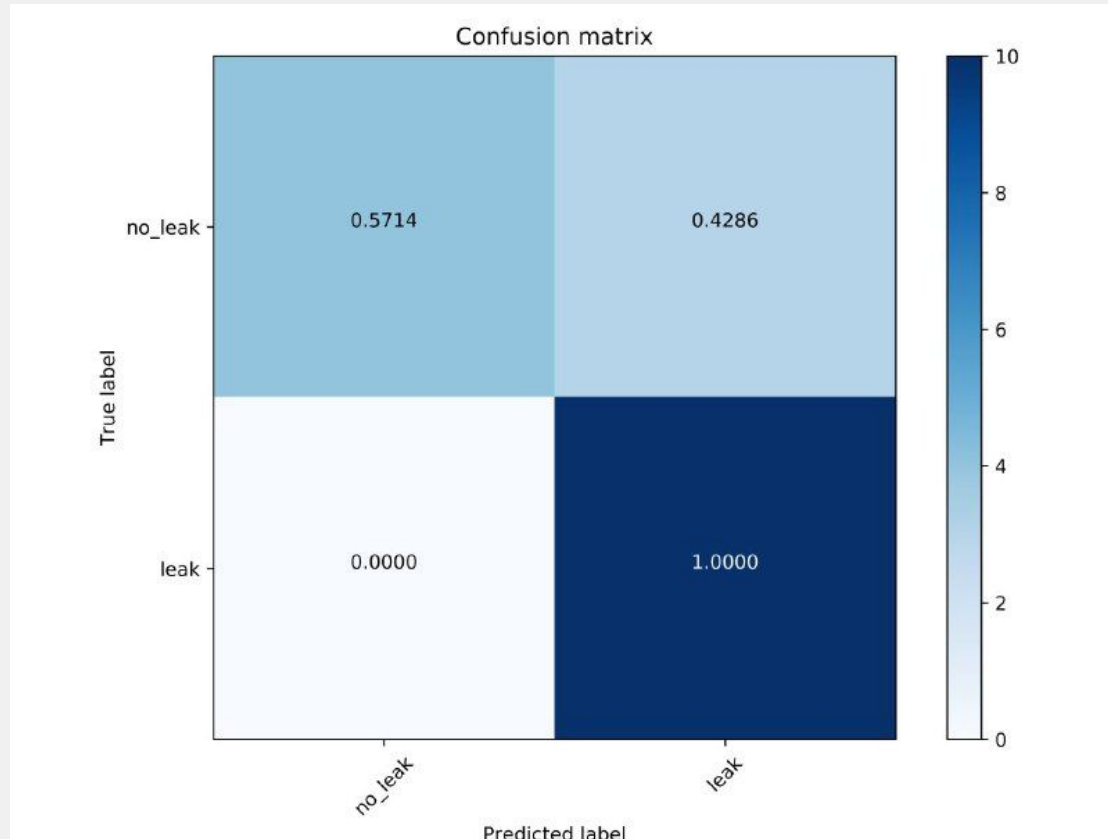
Evaluation: Konfusionsmatrix

CNN mit 2D



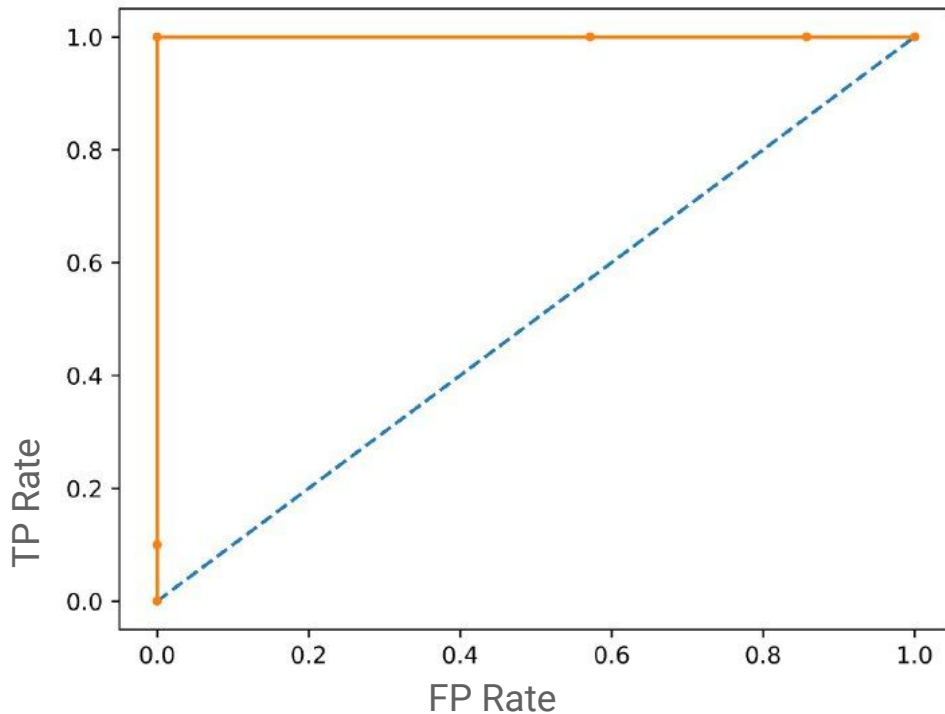
Evaluation: Konfusionsmatrix

SAE mit 10D



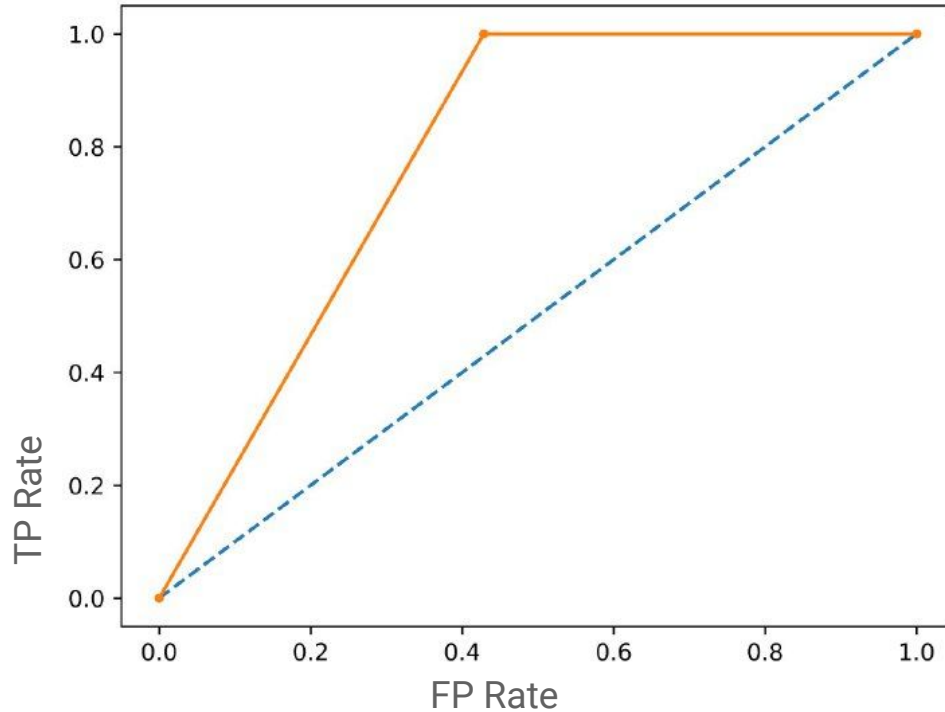
Evaluation: ROC AUC Kurve

CNN mit 2D



Evaluation: ROC AUC Kurve

SAE mit 10D



Fazit

Erfolge:

- Pipeline Setup auf unterschiedliche Systeme
- Deep-Learning-Methoden vielversprechend
- Spannende Erkenntnisse durch Analyse

Ausblick:

- Vereinzelte Fehlklassifikationen verbessern
- Mehr Experimente