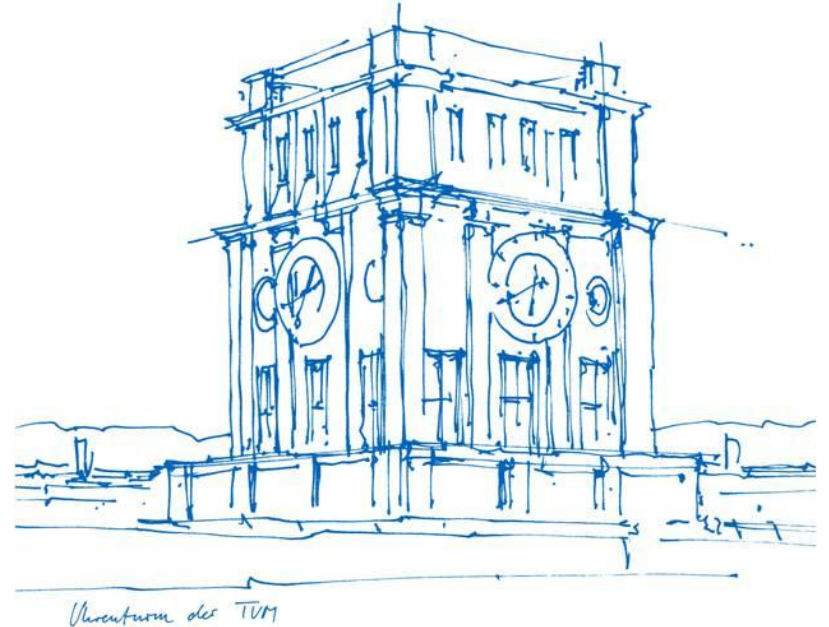# Analysis of Resolution Differences on a Segmentation Task

Nithin Balan

Youran Wang
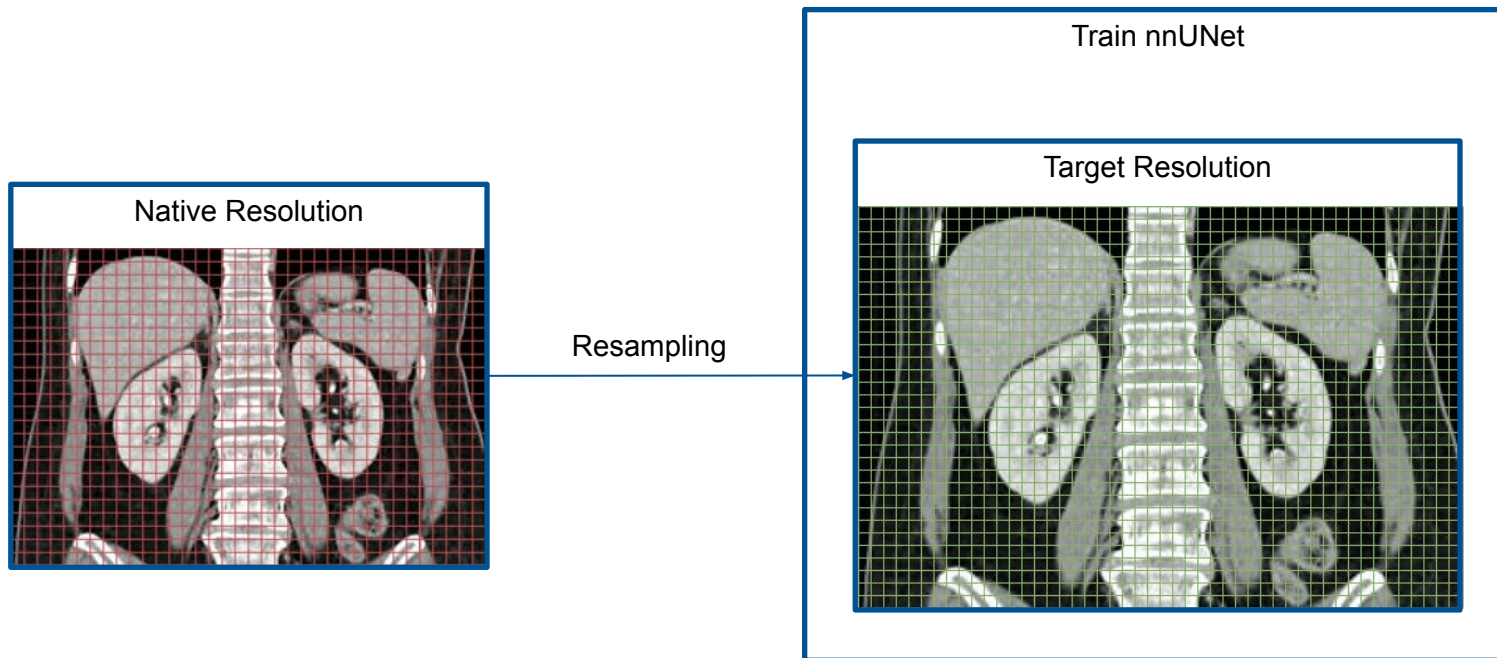
Jean Bartholmeß

Dmytro Shchurovskyi
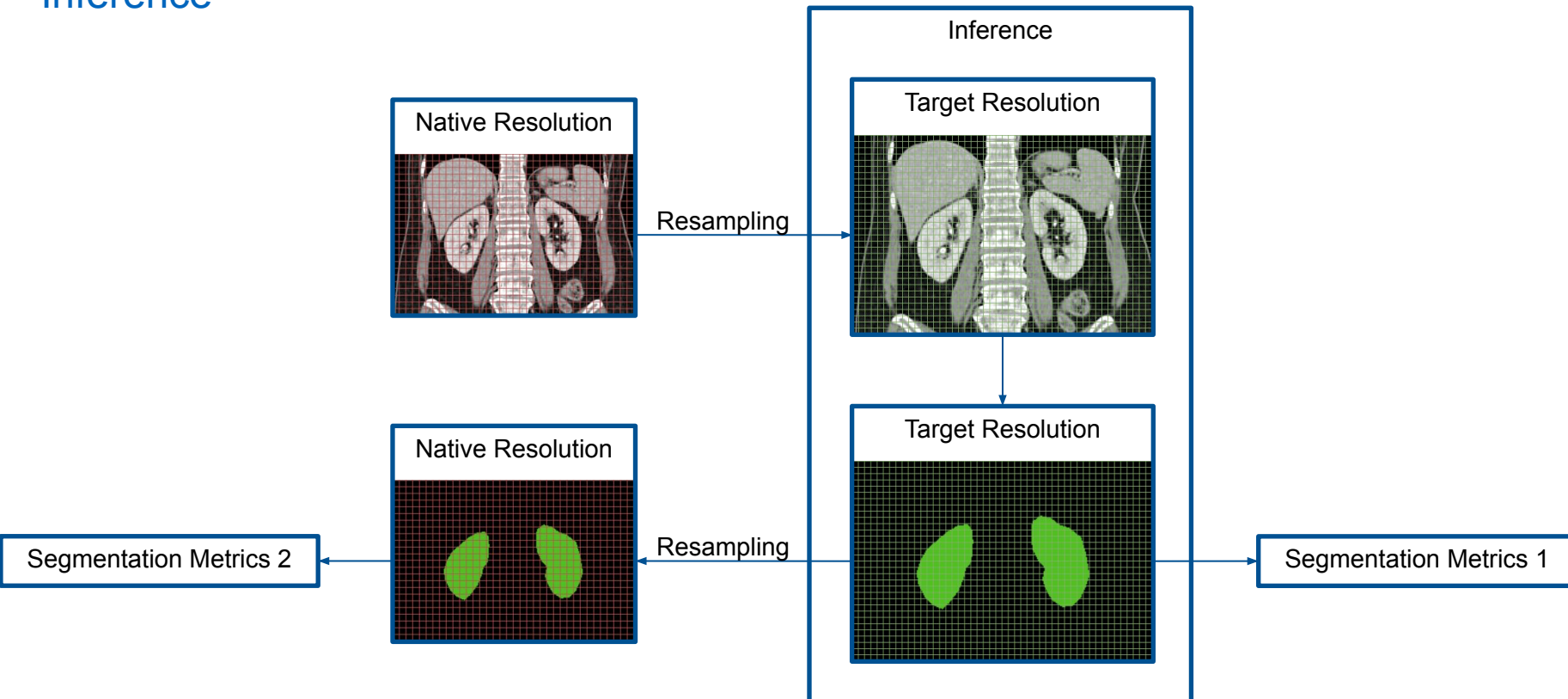
Topic Overview

Training
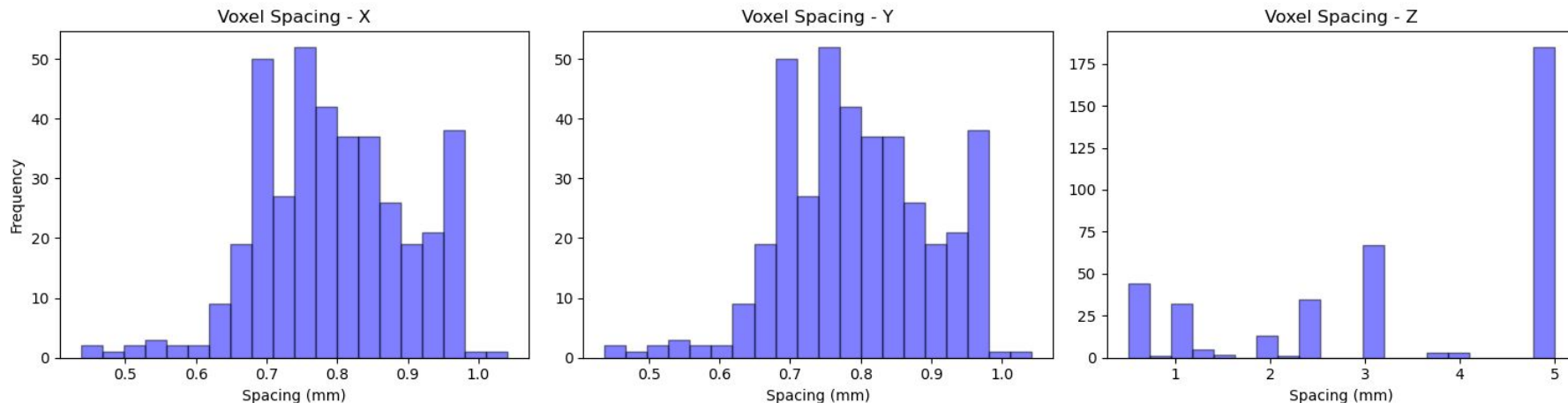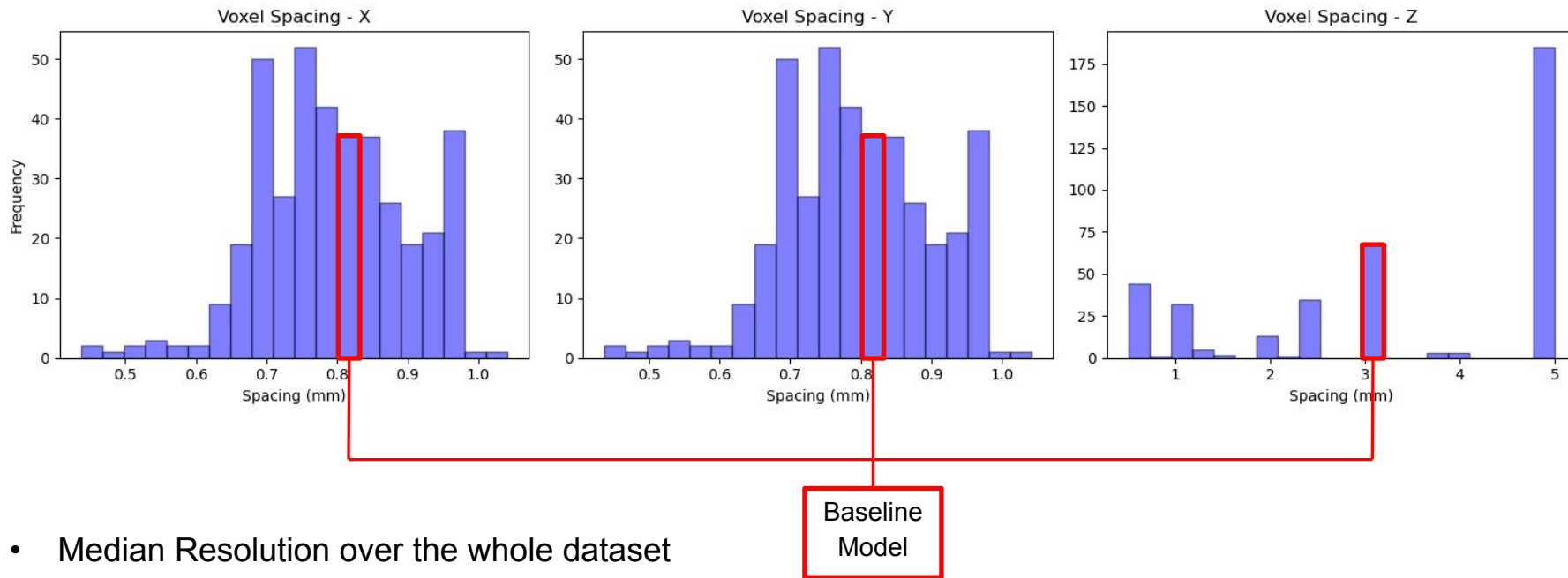
Topic Overview

Inference

What Resolutions to Train on

Dataset Voxel Spacing Histogram

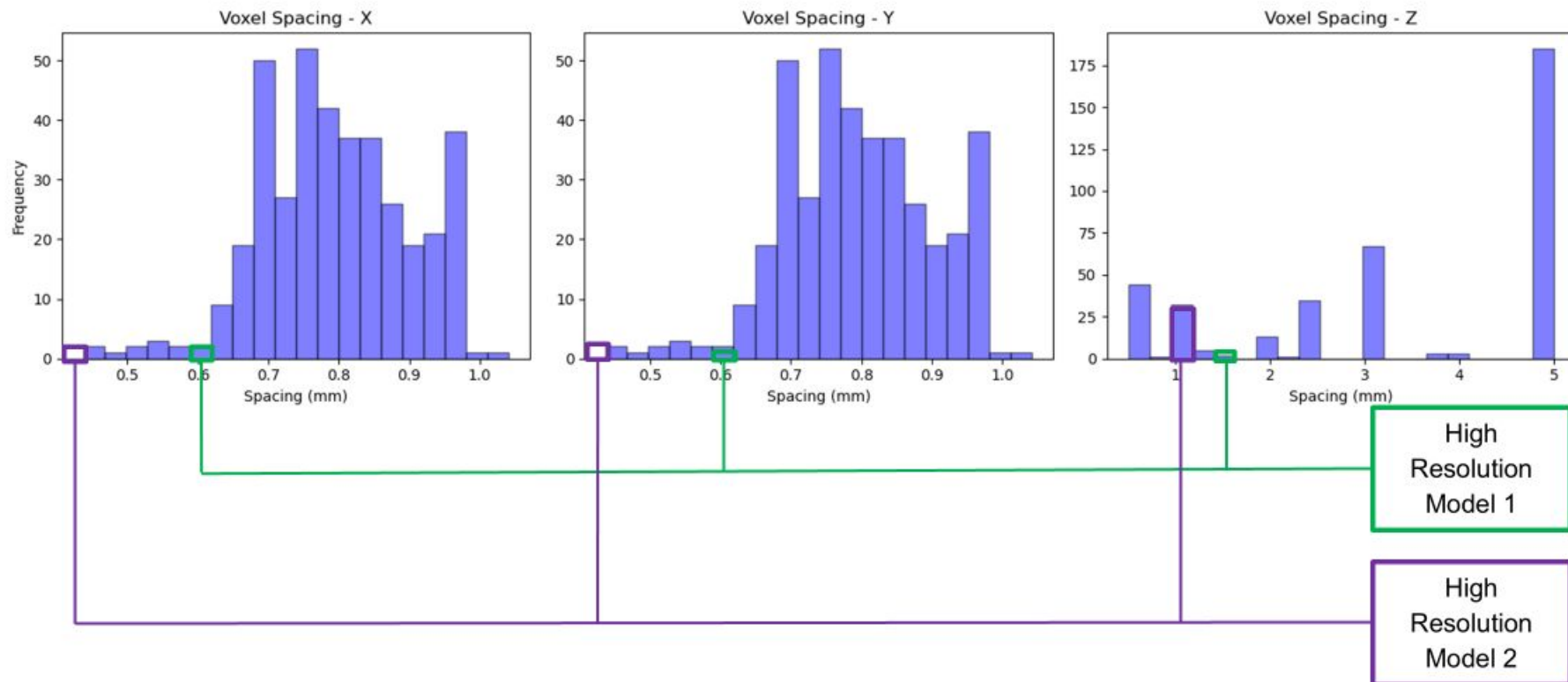# What Resolutions to Train on

Baseline Model

- Median Resolution over the whole dataset
- nnUNet default target resolution

What Resolutions to Train on

High-Resolution Models

What Resolutions to Train on
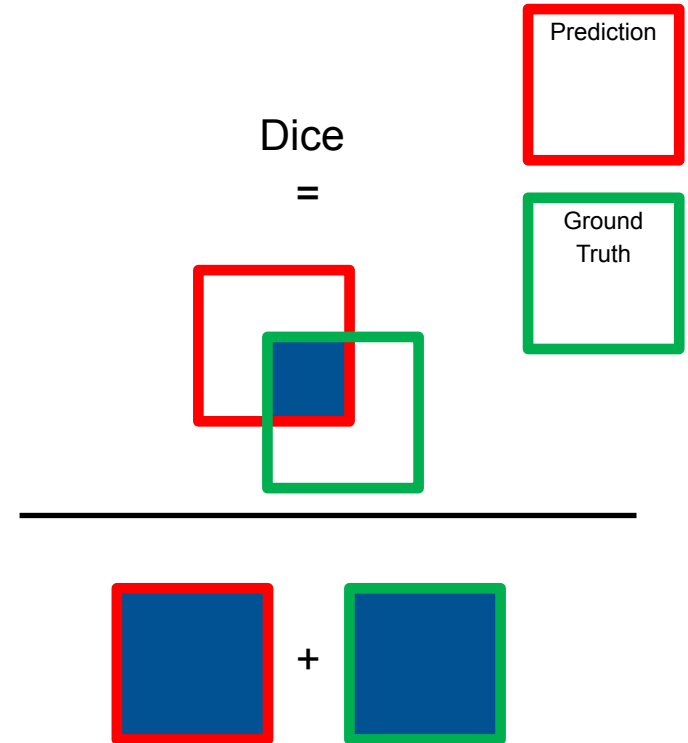
Patch Size

Increase Resolution

Increase Patch Size
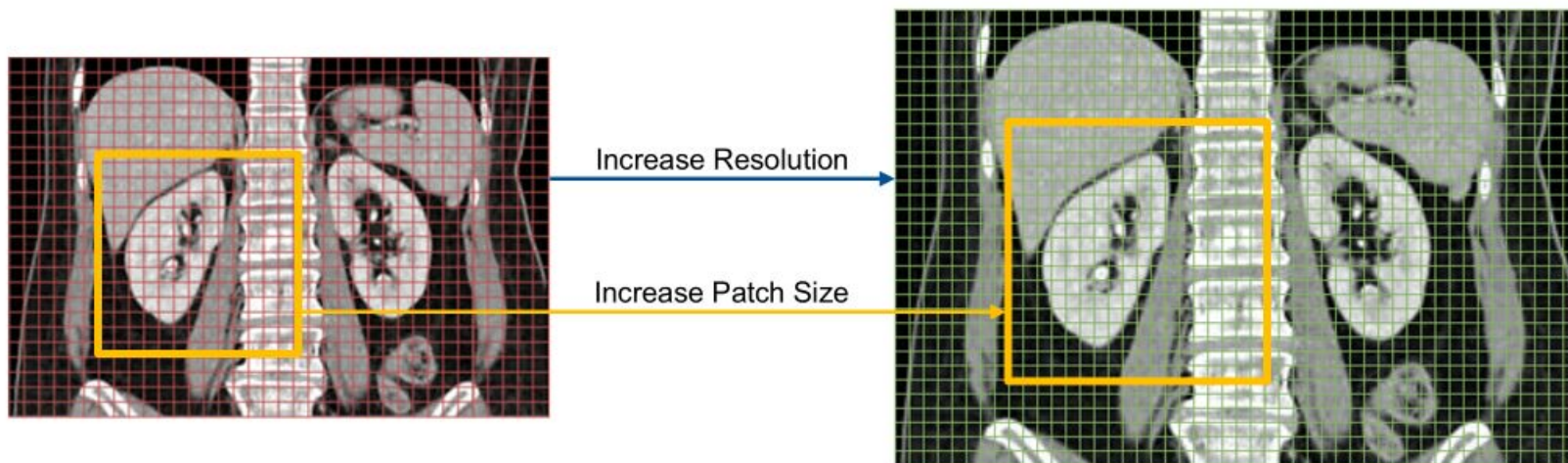
Dice Score

Choice of Semantic Segmentation Metrics

- **Definition:** Measures overlap between prediction and ground truth masks.
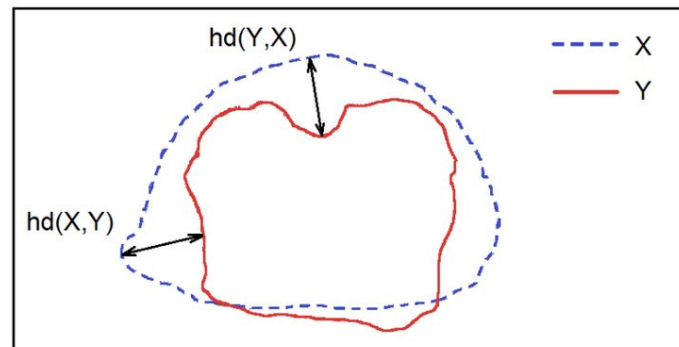- **Range:** 0 (no overlap) to 1 (perfect match)
- **Use:** Popular in medical segmentation tasks
- **Pros:** Handles class imbalance well

HD Score

Choice of Semantic Segmentation Metrics

- **Definition:** Max distance between predicted and ground truth boundary points.
- **Use:** Captures worst-case boundary error
- **Issue:** Sensitive to outliers

ASSD Score

Choice of Semantic Segmentation Metrics

- **Definition**: Average surface distance between boundaries of prediction and ground truth.
- **Use**: Robust measure of boundary alignment
- **Pros**: More stable than HD
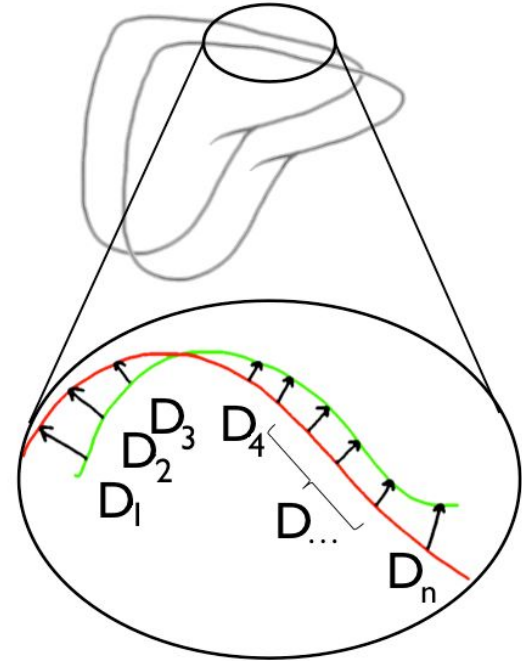
Comparison of different models

Choice of Semantic Segmentation Metrics

Where we are now
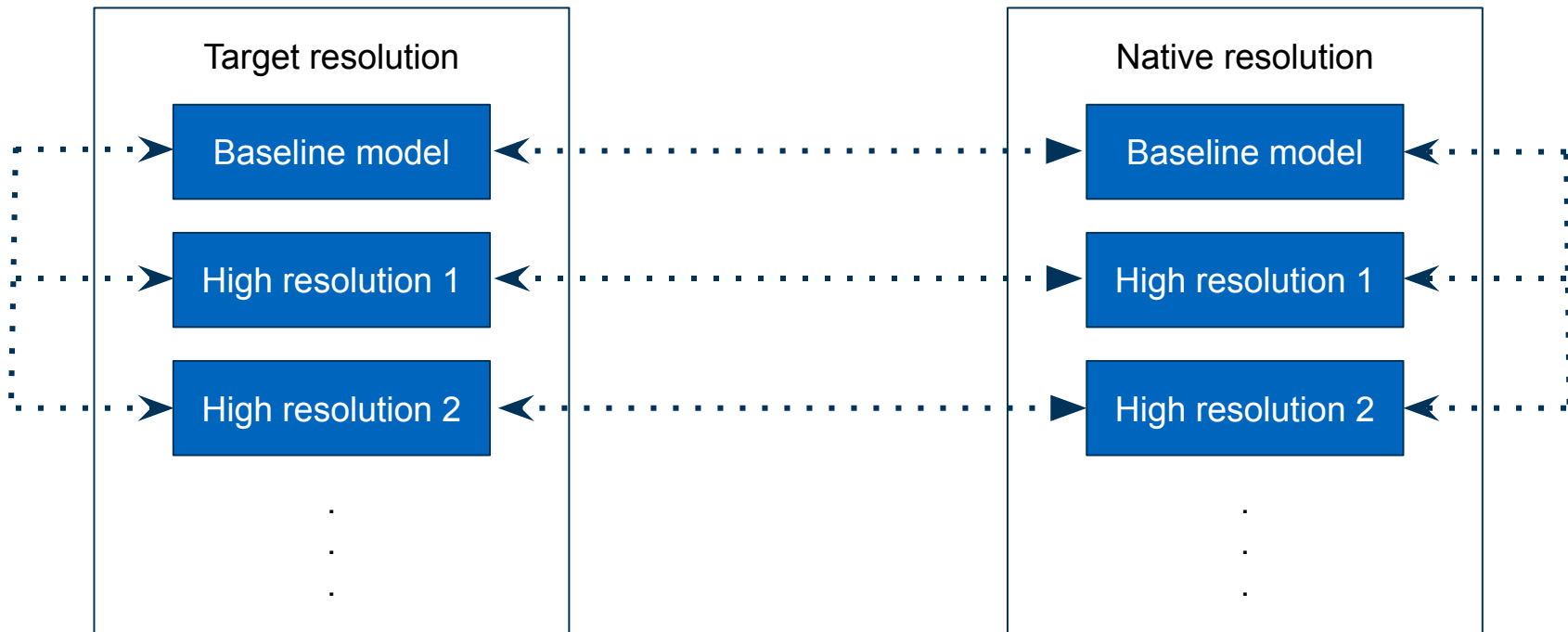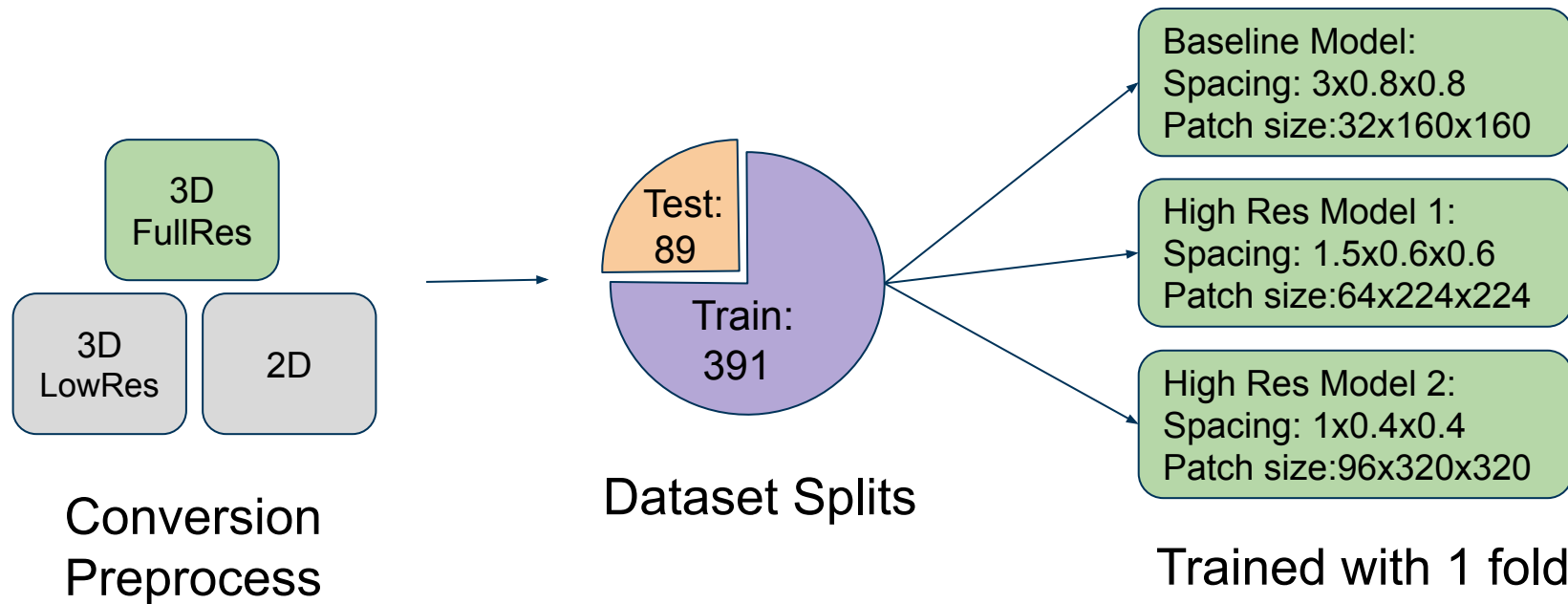
Kits2023 Dataset

3D FullRes

3D LowRes

2D

Conversion Preprocess

Test: 89

Train: 391

Dataset Splits

Baseline Model:
Spacing: 3x0.8x0.8
Patch size:32x160x160

High Res Model 1:
Spacing: 1.5x0.6x0.6
Patch size:64x224x224

High Res Model 2:
Spacing: 1x0.4x0.4
Patch size:96x320x320

Trained with 1 fold

Where we are now

Spider Dataset

Orientation Converted

- PIR: 22
- LPS: 188

Conversion Preprocess

- 3D FullRes
- 3D LowRes
- 2D

Dataset Splits

- Test: 42
- Train: 168

Baseline Model:
Spacing: 3.3x0.6x0.6
Patch size:16x320x320

High Res Model 1:
Spacing: 3.2x0.5x0.5
Patch size: 16x384x384

High Res Model 2:
Spacing: 3.1x0.4x0.4
Patch size: 48x384x96

Training with 1 fold
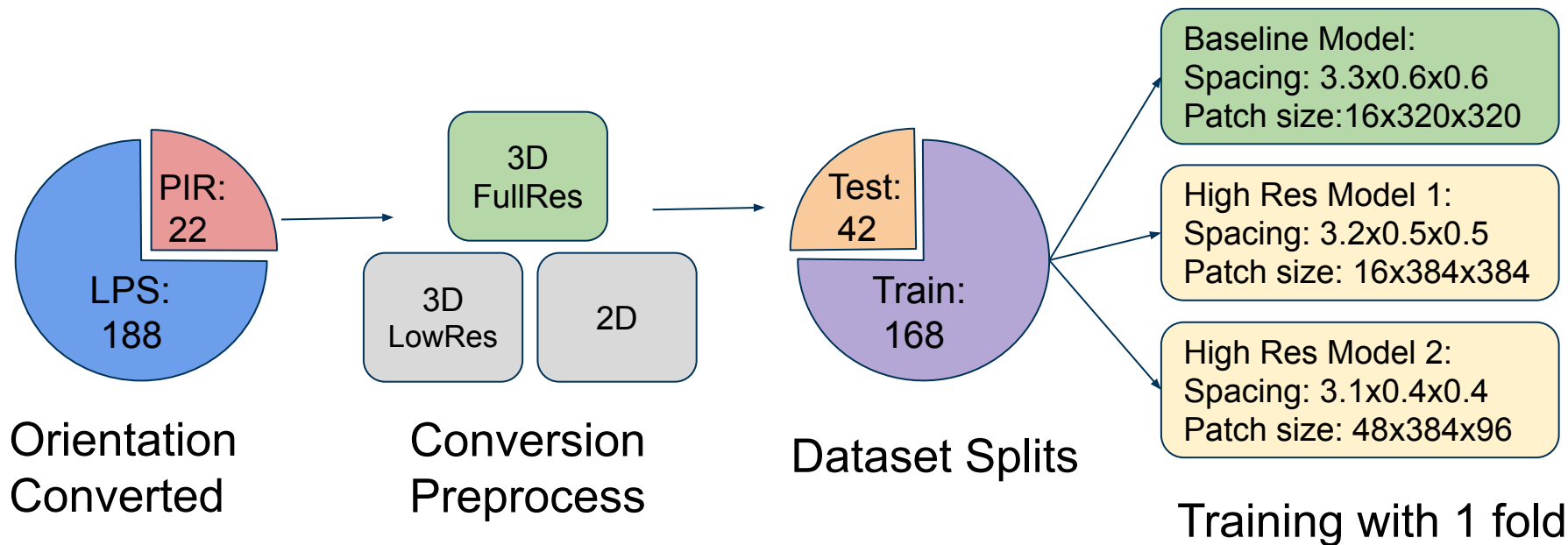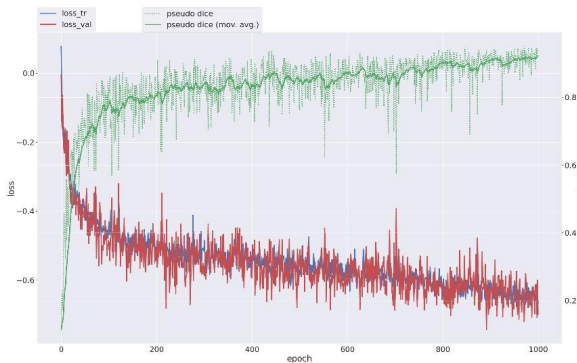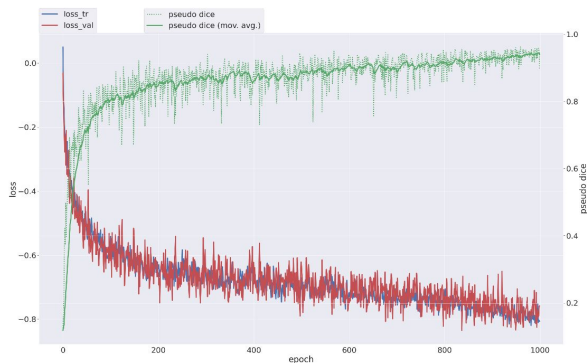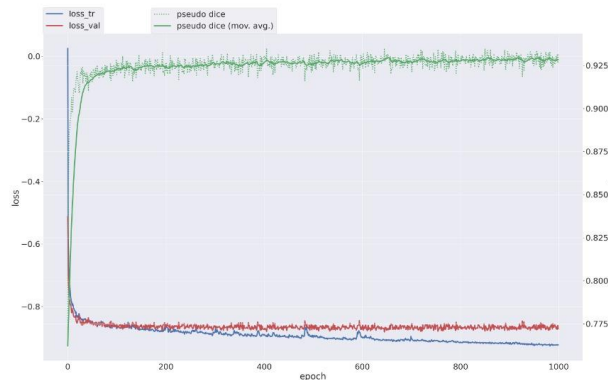
Training Result
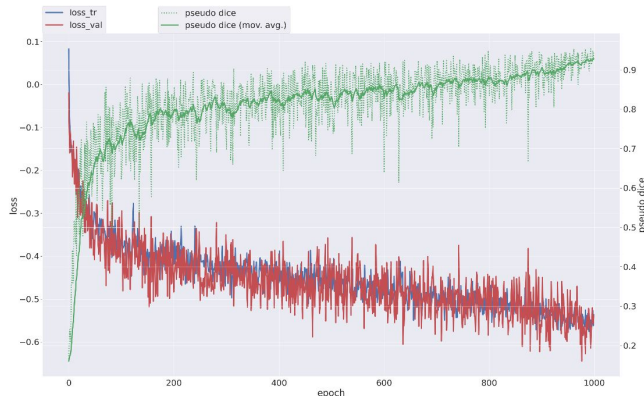
Baseline Model Kits2023

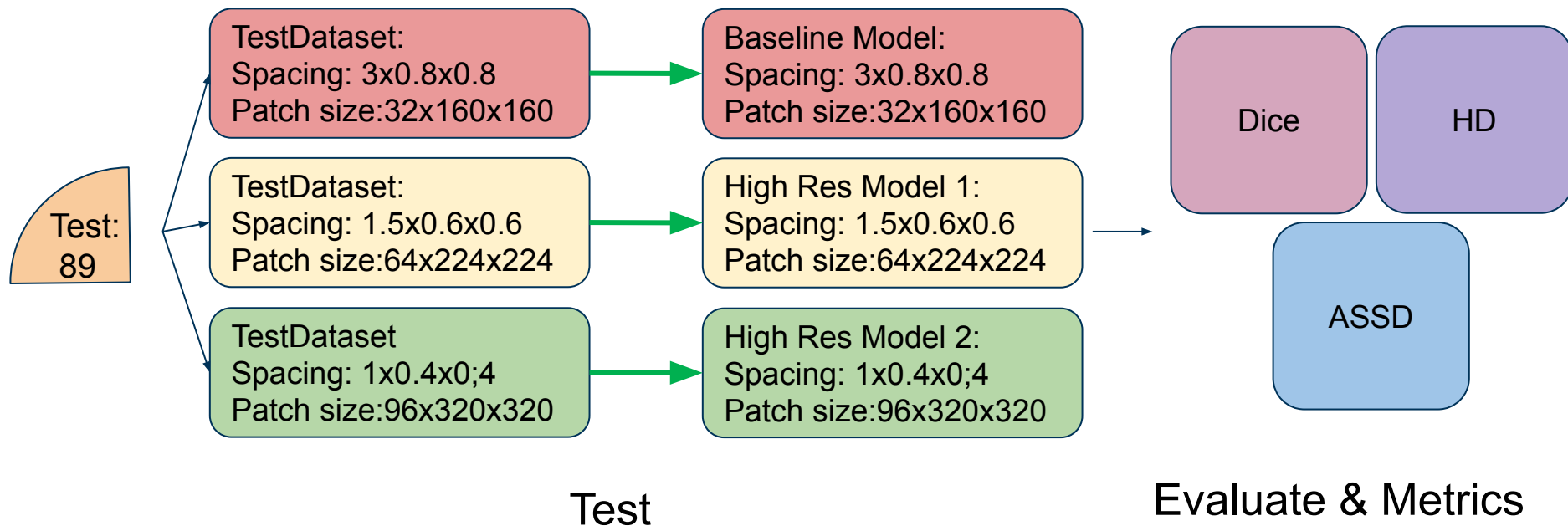High Res Model 1

High Res Model 2

Baseline Model SPIDER

Problem:

"background workers are not alive"
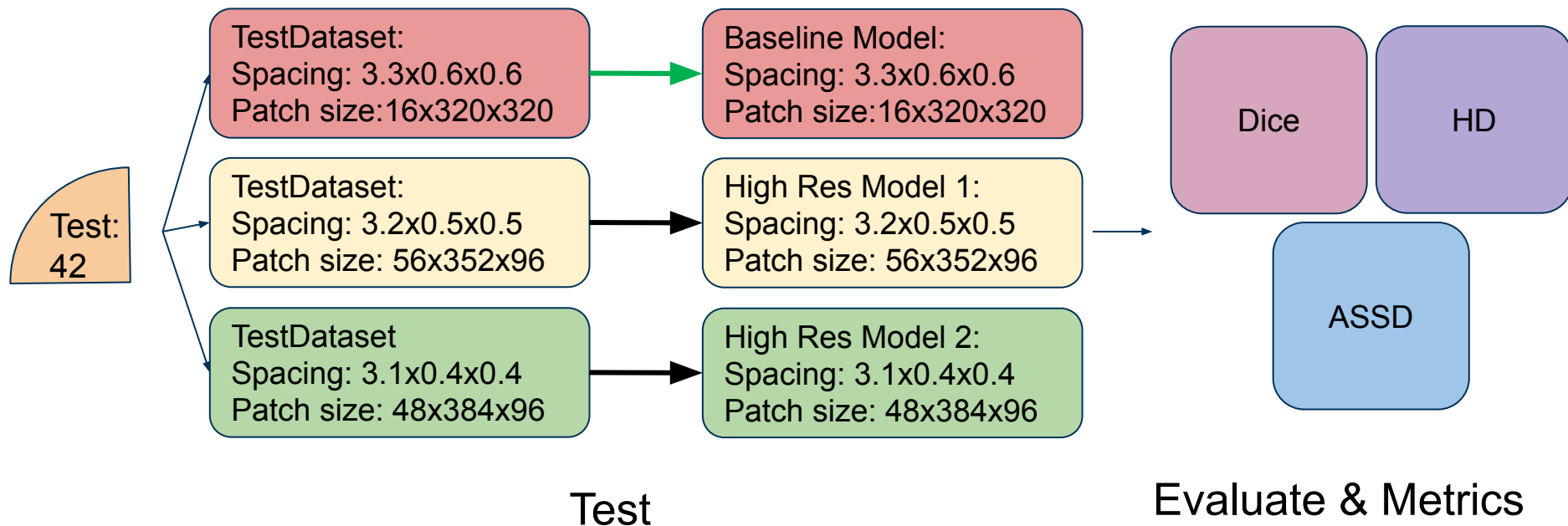
"Some of the step tasks have been OOM Killed."

Next Steps

Kits2023 Dataset

Test:
89

TestDataset:
Spacing: 3x0.8x0.8
Patch size:32x160x160

Baseline Model:
Spacing: 3x0.8x0.8
Patch size:32x160x160

TestDataset:
Spacing: 1.5x0.6x0.6
Patch size:64x224x224

High Res Model 1:
Spacing: 1.5x0.6x0.6
Patch size:64x224x224

TestDataset
Spacing: 1x0.4x0;4
Patch size:96x320x320

High Res Model 2:
Spacing: 1x0.4x0;4
Patch size:96x320x320

Dice

HD

ASSD

Test

Evaluate & Metrics

Next Steps

Spider Dataset

TIM

Test

Evaluate & Metrics

References

1. https://medium.com/@nghihuynh_37300/understanding-evaluation-metrics-in-medical-image-segmentation-d289a373a3f