UF | Intelligent Critical Care Center
UNIVERSITY of FLORIDA

Final Project

EEL 6935: Deep Learning in Medical Image Analysis

Fall 2025

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Grading Policy

- Quiz – 20%
  - 4 in-class quizzes
- Homework – 40%
  - 4 homework assignments
- Final Project – 40%
  - Includes presentation and report

Final Project Evaluation

- Project Report (50 points)
  - Problem Statement (10 points)
  - Rigor of Approach (30 points)
  - Writing Quality (10 points)

- Oral Presentation (50 points)
  - Problem Statement (10 points)
  - Rigor of Approach (30 points)
  - Presentation Skills (10 points)

Example Research Projects

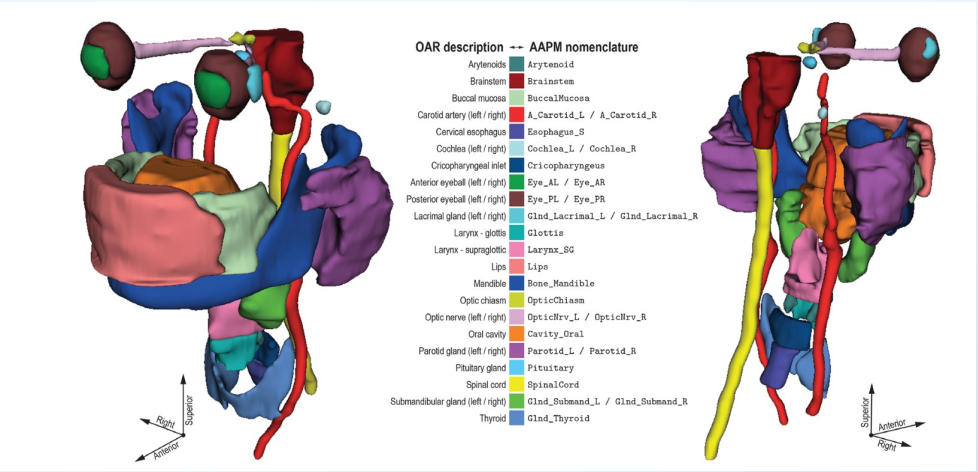
- Multi-class, multi-modal Image segmentation: Head neck organ-at-risk CT & MR Segmentation (HaN-Seg) challenge.
- Image registration: Learn2Reg grand challenge.
- Image super-resolution: Multi-image super-resolution of prostate MR images.

3D Image Segmentation

HaN-Seg Challenge

Dataset:

- Paired CT and T1-weighted MR scans of 42 patients.
- 30 segmentation masks available only for the CT images.
- Download link: https://zenodo.org/records/7442914.



HaN-Seg Challenge

Aims:

- Multi-class segmentation of 30 organs-at-risk (OARs).
- Address high anatomical variability across patients.
- Achieve effective CT–MR information fusion for robust OAR segmentation.

Image Registration

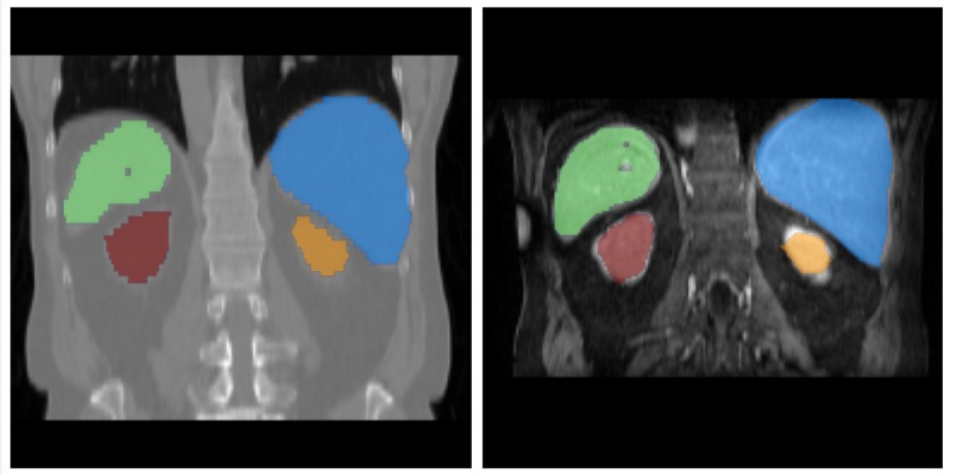
Learn2Reg Challenge

- Learn2Reg addresses four of the challenges of medical image registration:
  - learning from relatively small datasets
  - estimating large deformations
  - dealing with multi-modal scans
  - learning from noisy annotations
- Datasets: https://learn2reg.grand-challenge.org/Datasets/
- Tasks
  - CT-MR thorax-abdomen intra-patient registration
  - CT lung inspiration-expiration registration
  - MR brain image registration

To download dataset: https://learn2reg.grand-challenge.org/Learn2Reg2021/

Task 1: CT-MR thorax-abdomen intra-patient registration

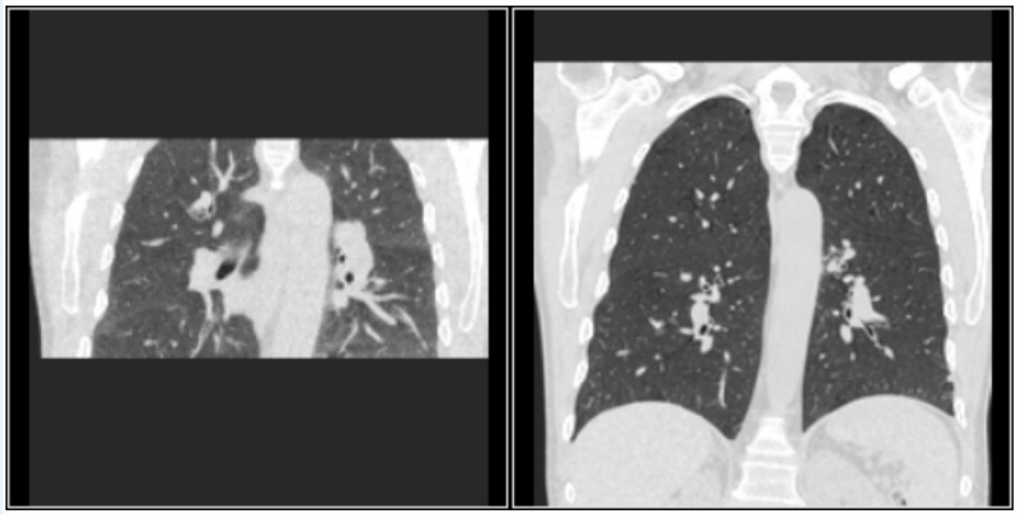
- Challenges:
  - Multi-modal registration
  - Missing information
  - Learn from small training dataset



Abdomen CT Abdomen MRI

Task 2: CT lung image registration

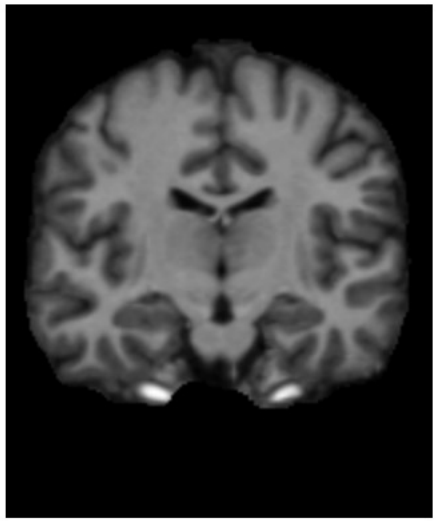
- Challenges:
  - Large displacement deformation.
  - Missing information in the exhalation CT.



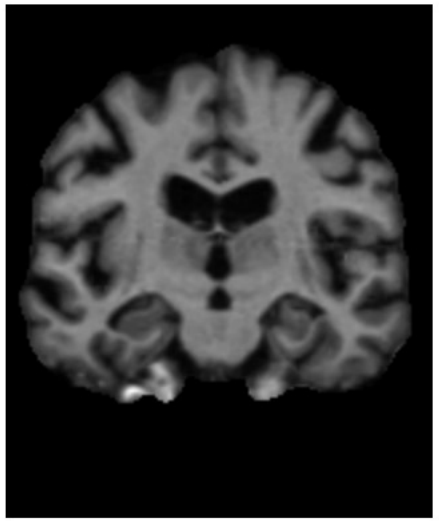
Exhalation CT Inhalation CT

Task 3: MR Brain Registration

- Challenges:
  - Alignment of small structures
  - Inter-patient registration



Brain MRI: patient 1

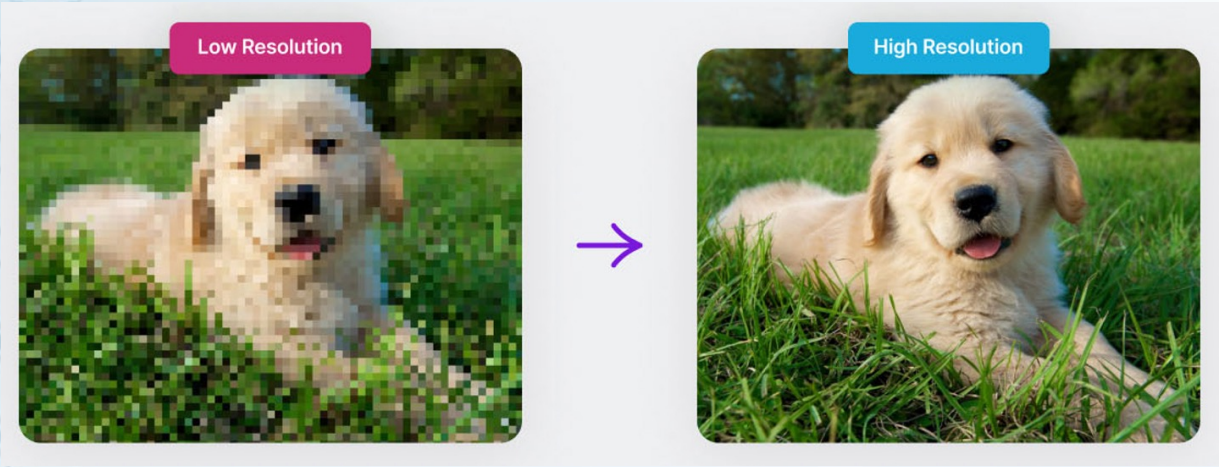


Brain MRI: patient 2

Image Super-Resolution

Multi Image Super-Resolution

Goal: predict slices between two input slices.



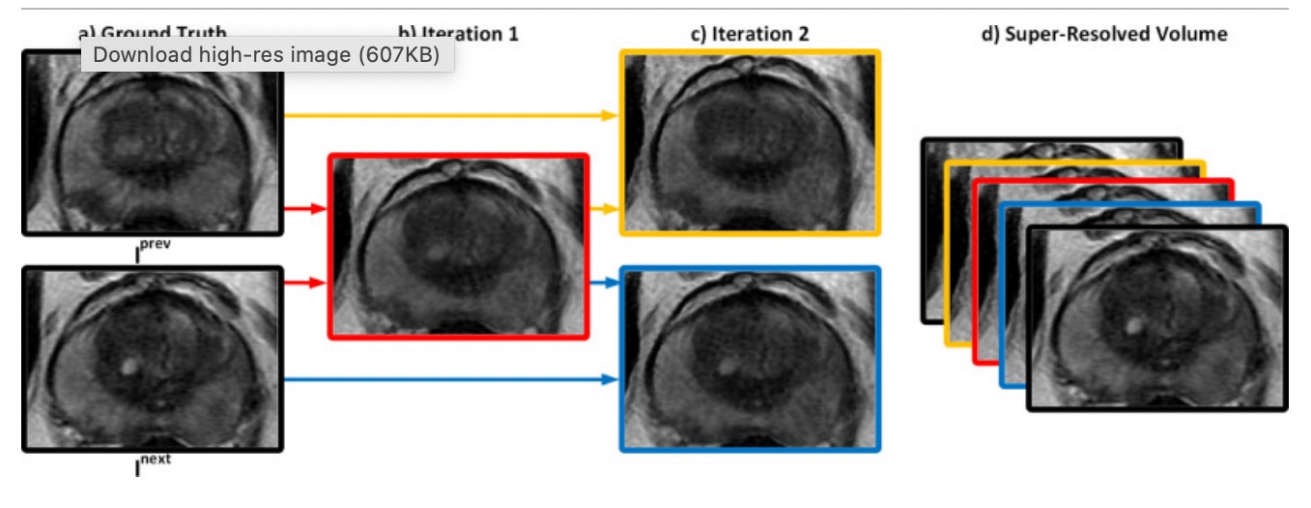
Single Image Super-Resolution

Multi Image Super-Resolution

https://www.v7labs.com/blog/image-super-resolution-guide

Multi Image Super-Resolution

- Prostate-MRI-US-Biopsy Dataset
  - T2-w MRI scans of 1151 patients
  - In-plane resolution = 0.547 mm, through-plan resolution =1.5 mm.
  - Download dataset: https://wiki.cancerimagingarchive.net/pages/viewpage.action?pageId=68550661



https://www.sciencedirect.com/science/article/pii/S1361841521000037

Project Report

- 8-page, excluding references.
- Single-column.
- Introduction, Related Work, Dataset, Method, Results, Discussion and Conclusion.
- Download WORD or LATEX template: https://www.springer.com/gp/computer-science/lncs/conference-proceedings-guidelines

Timeline

- October 13: Choose your research project.
- October 13 – November 30: Model development phase.
- December 1 & 3: In-class project presentations.
- December 5: Final project report due.