VISUAL INTELLIGENCE

Workshop on 3D Deep Learning

Visual Intelligence Graduate School

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Workshop information

- First VIGS event!
- Motivation: information sharing.
- Schedule
  - 12:15 - 12:30: Introduction and overview of 3D deep learning (Kristoffer Wickstrøm, UiT)
  - 12:30 - 12:50: 3D deep learning for MRI brain imaging (Esten Leonardsen, UiO)
  - 12:50 - 13:00: Discussion
  - 13:00 - 13:15: Break
  - 13:15 - 13:30: 3D deep learning for PET imaging (Luigi Luppino, UiT and 180N)
  - 13:30 - 13:50: 3D deep learning for CT liver imaging (Eirik Østmo, UiT)
  - 13:50 - 14:00: Discussion

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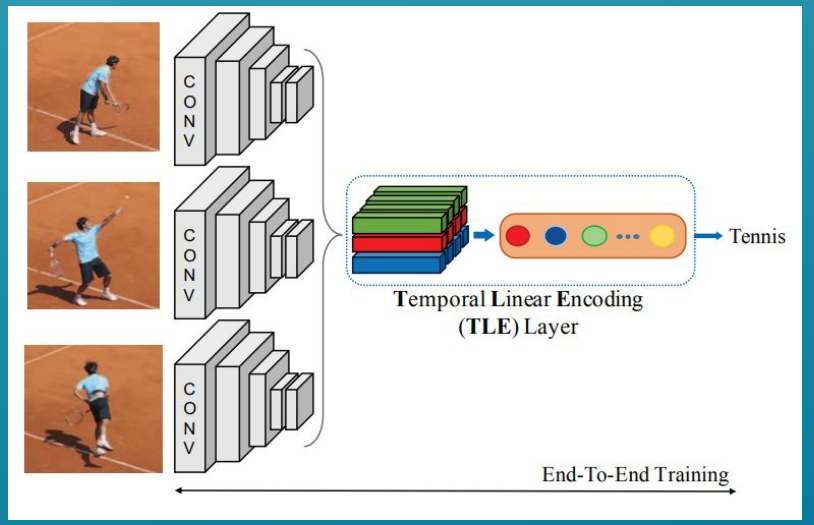
3D data

- Numerous examples of 3D data:
  - Medical images such as CT, PET, and MRI.
  - Video.
  - Point clouds from LiDAR in self-driving cars.

- Provides additional information.
- Focus on medical data in this workshop.



Diba et.al., CVPR 2017

Challenges associated with 3D data

- What challenges can we encounter with 3D data?
- How to handle them?

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Challenge 1: memory issues

- Big images + big models = memory issues.
- Boring but critical.

Challenge 2: choice of architecture

- No “standard” architecture.
- Related to memory issues.
- Can we just 3D-ify 2D architectures?
  - yes and no [1].

[1] Okan Köpüklü et.al., Resource Efficient 3D Convolutional Neural Networks, ICCV Workshop 2019

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Challenge 3: varying number of slices.

- The number of channels in a 3D image can vary a lot.
- Also related to memory issues.
- How to tackle it?
  - Crop?
  - Interpolate?
  - Work with batches of size 1?

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Challenge 4: transfer learning

- Often a key component in medical image analysis.
- Related to choice of architecture.
- What dataset to pretrain on?
- Can be helpful, but must be able to use the model [2].

[2] Marco Kleibler et.al., A Systematic Literature Review on Transfer Learning 3D-CNNs, IJCNN 2021

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Summary

- Lots of opportunities and challenges!
- Probably additional challenges, let us know!
- Could we converge on solutions together?

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