EE/CprE/SE 491 WEEKLY REPORT 01

Video Pipeline for Machine Computer Vision

08/22/24 – 19/19/24
Group number: sdmay25-01
Advisors: Dr. Jones and Dr. Zambreno
Client: JR Spidell

Team Members:

Lindsey Wessel — *Tracking the Region of Interest with Machine Learning*
James Minardi — *Role TBD (Client Meeting 9/20/24 to determine)*
Eli Ripperda — *Role TBD (Client Meeting 9/20/24 to determine)*
Mason Inman — *Semantic Segmentation Optimization*

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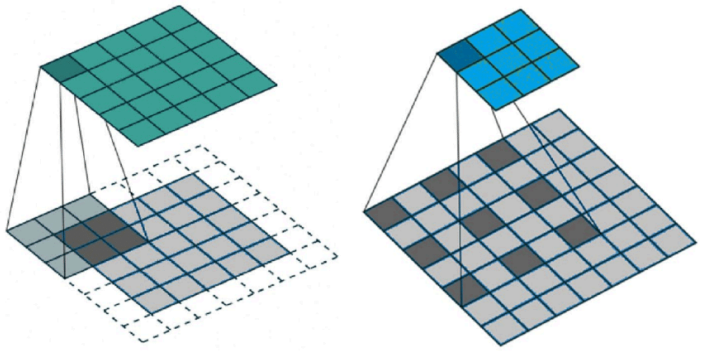
Weekly Summary:

This week, week four of the fall semester of 2024, our team has focused on clarifying our deliverables and individual roles. A couple of individual members of our team have met with members of the ISU V-PIPE and HAML teams to better understand their roles and progress. A couple of members of our team have conducted research on specific areas of interest, and one has made progress on setting up OpenCV. We have completed the Team Contract and Initial Design Concepts assignments.

Past Week Accomplishments

- Lindsey's Accomplishments
  - Conducted research on face detection
    - Create a development environment
- James' Accomplishments
  - Elected team leader for week 4
  - Review Ultra96 documentation
- Eli's Accomplishments
  - Communication with all involved parties about NDA
- Mason's Accomplishments
  - Videos and Articles used for research:
    - Dilated Convolution: I needed to refresh my linear algebra knowledge and the basics and I went through this lecture video to review the linear algebra backing of convolutions.



(a) (b)

- https://www.youtube.com/watch?v=0Lg_V0Um-1Q

    - I read a research article over the UNET architecture to gain a high level understanding of the model I will be implementing and optimizing for this project.
      - https://arxiv.org/pdf/1706.05587
    - I completed further research into applying the basic convolutions with PyTorch, which we will be using. PyTorch offers easy ways to manipulate the data how you want with methods and structures

available to the user, for example computing 2D convolutions is done trivially with PyTorch.
    - https://www.youtube.com/watch?v=n8Mey4o8gLc
  - ➢ Communicated Team Announcements between client and group
  - ➢ Met with the previous Senior Design Team to walk through development, acting as a form of handoff meeting.
- ❖ Team Accomplishments
  - ➢ Other Accomplishments

Pending Issues

- ❖ Lindsey's Issues
  - ➢ The main problem so far is the environment setup with version control. Currently, working on troubleshooting these problems with Mason's help due to his prior experience in this field.
- ❖ James' Issues
  - ➢ Lacking specifics in the scope of work.
  - ➢ Not sure what next steps are in the short term.
- ❖ Eli's Issues
  - ➢ Lacking specifics in the scope of work.
  - ➢ Not sure what the next steps are in the short term.
- ❖ Mason's Issues
  - ➢ Learning curve, but no blocking issues currently. Further research is required. Must receive NDA and training data from the client to begin more detailed work on the design.
- ❖ Team Issues
  - ➢ Requiring more information and clarification on advisor concerns.

Individual Contributions

Name	Cumulative Hours	Week 3
Lindsey	24	8
James	24	8
Eli	24	8
Mason	25	9
Team	96	32

Forward Plan

- Lindsey's Plan
  - NDA
  - Study Face Detection
  - Study Eye Tracking
- James' Plan
  - NDA
  - Receive hardware
  - Determine if CPRE 488 lab is important to do
  - Ramp up on current project progress and code base
- Eli's Plan
  - Copy Paste from JR Slides
- Mason's Plan
  - Continue learning about UNET architecture as well as create a mini-project to get hands-on experience with these models we will be implementing and optimizing.
- Team Plan
  - Meet with client and advisor in a group meeting to further clarify questions and concerns.

Advisor Meeting Notes

We held an advisor meeting where both advisors were informed of current status and asked us to clarify our deliverables and design requirements. Deliverables are discussed below. Design requirements are still a work in progress as we continue in 491.

Client Meeting Notes

We had an important client meeting defining the deliverables of our project. Our deliverables are to optimize the semantic segmentation model in place, implement software to detect the region of interest (ROI), software to display the results, and metrics associated with accuracy, speed, and latency to prove our overall optimizations work. Hardware involvement is still unknown, but we are having continued meetings between the advisors and the client to answer our outstanding questions.