



16TH EUROPEAN CONFERENCE ON  
**COMPUTER VISION**

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# *CorNet: Unsupervised Deep Homography Estimation for Agricultural Aerial Imagery*

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  - Efficient and accurate homography estimation

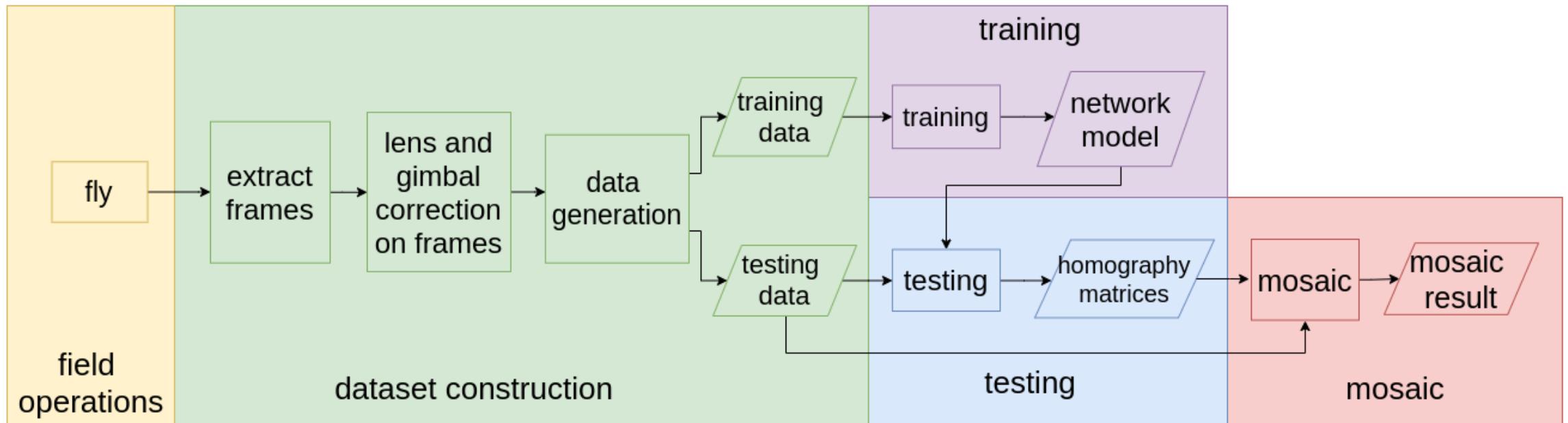
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  - Mosaic using only pixel information (no telemetry)
  - richer information from freely flown vehicles

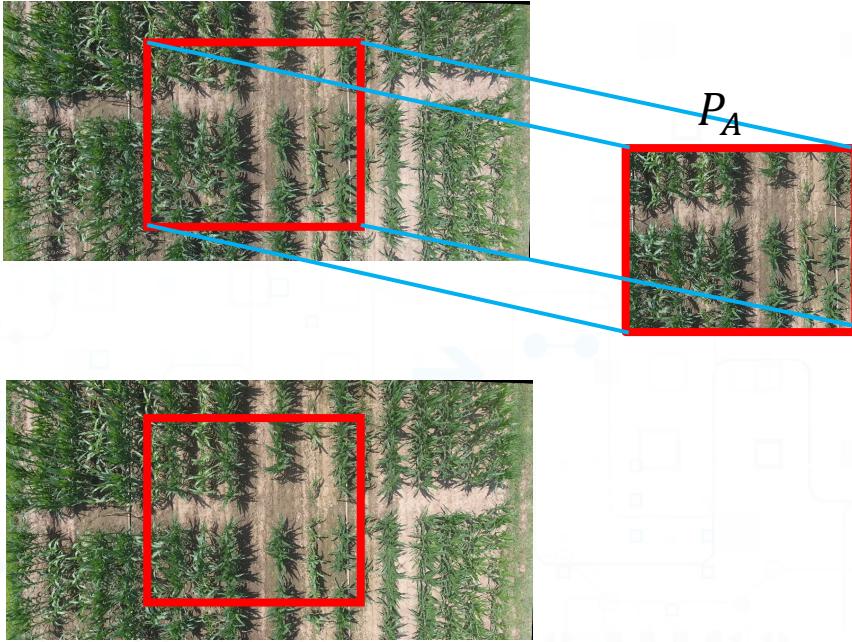
# CorNet's Pipeline



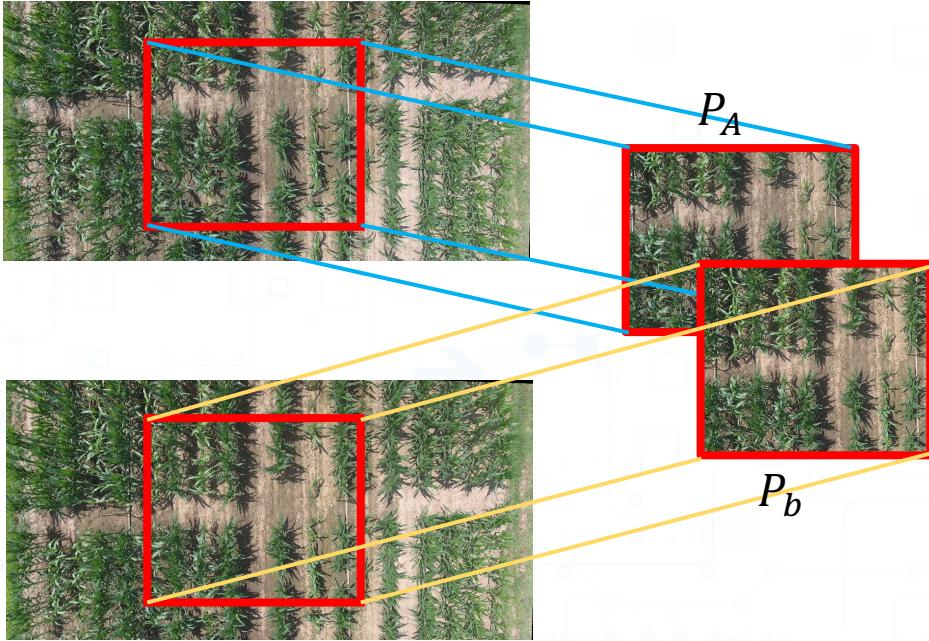
# Unsupervised Homography Estimation



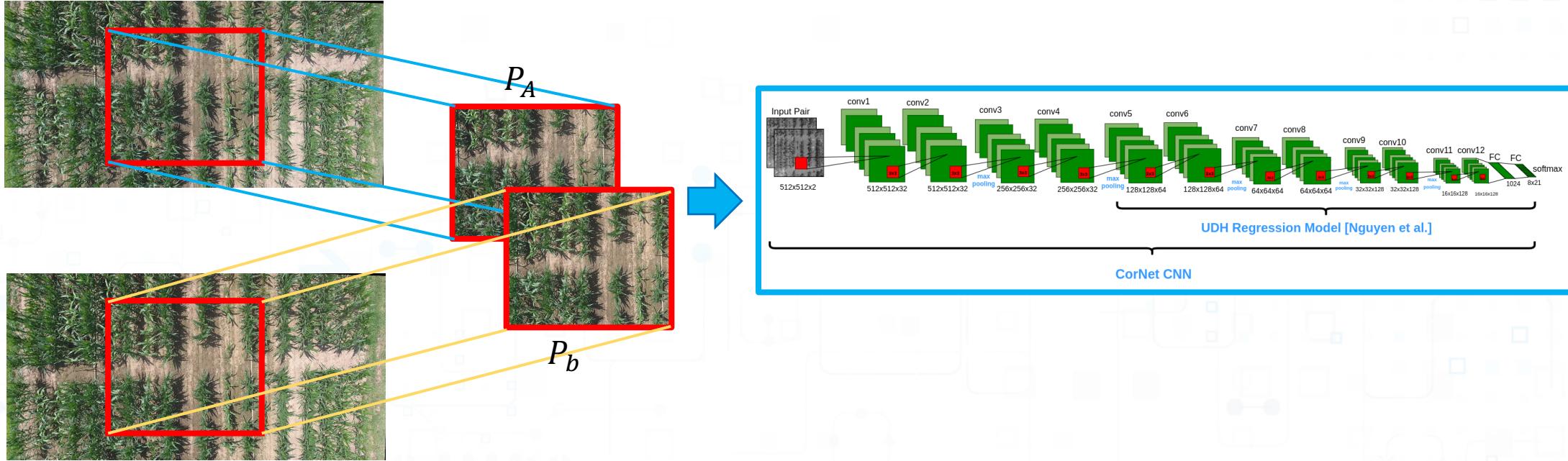
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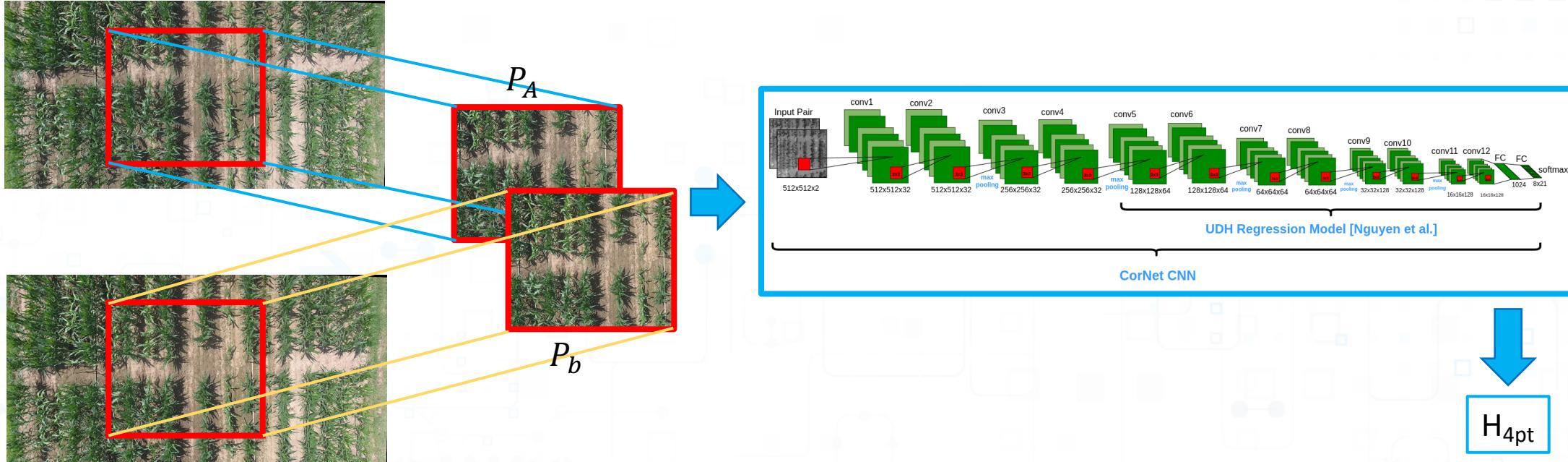
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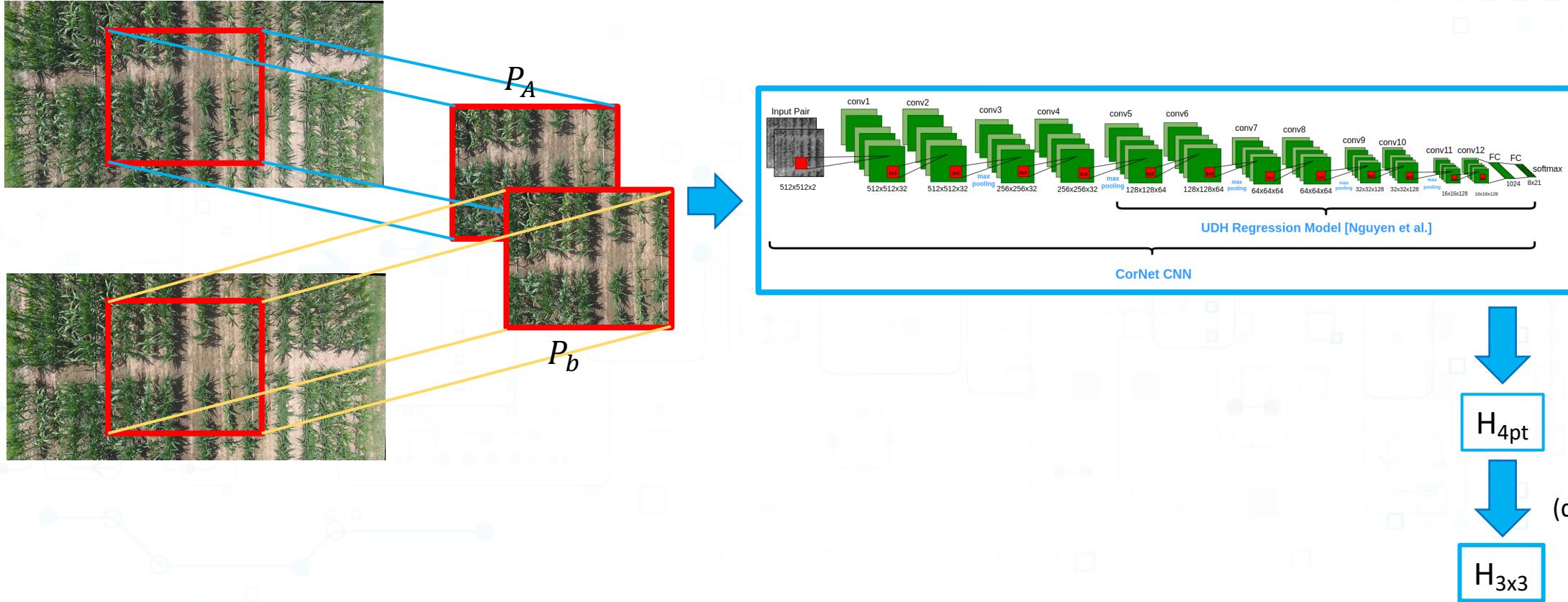
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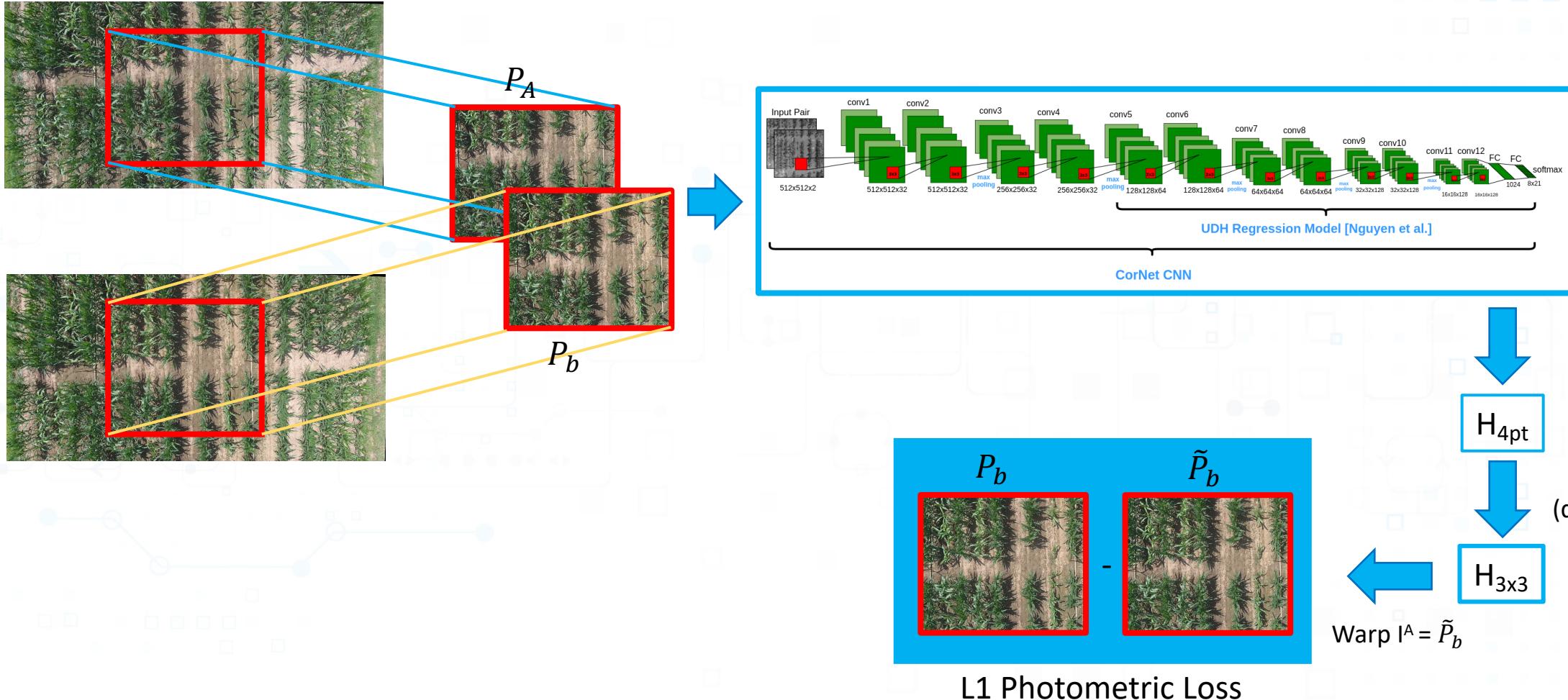
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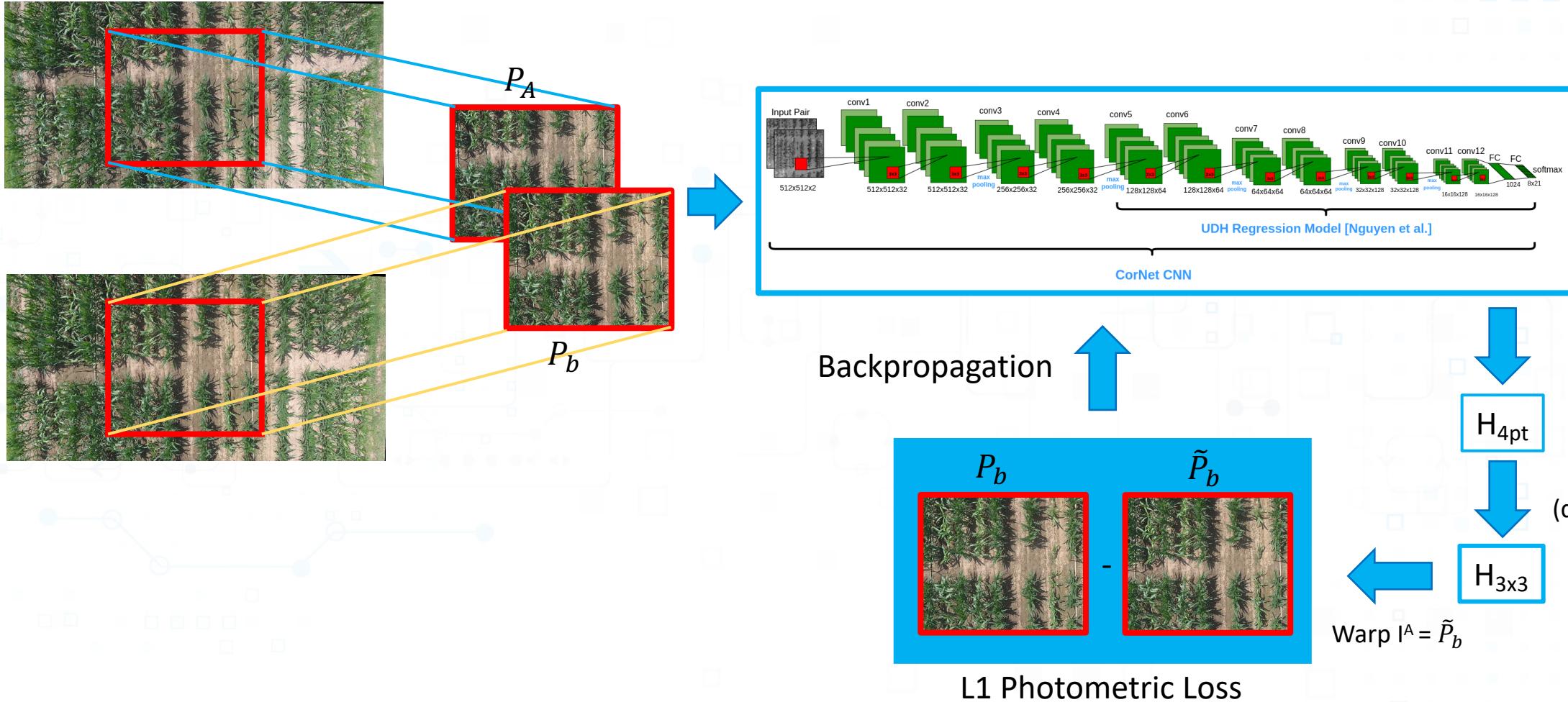
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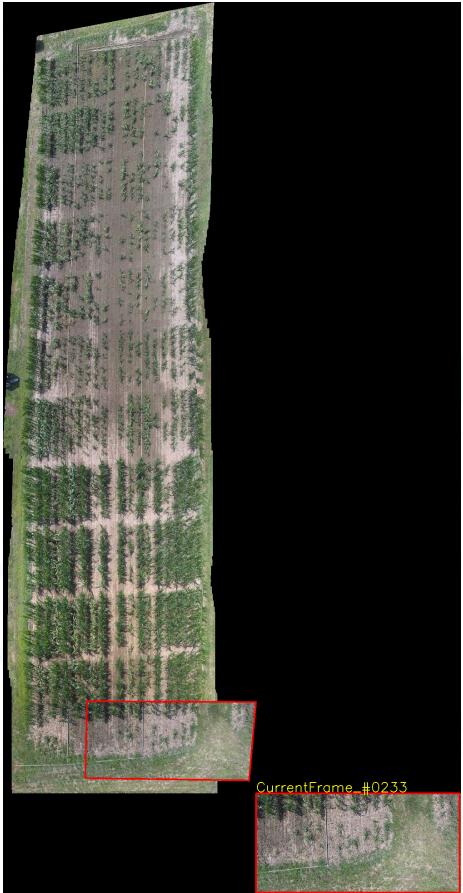


# Dataset of Complex Movements

- Training dataset
  - 27,228 image pairs for *rUDH (retrained UDH)*
  - 18,422 image pairs for *CorNet*
- Testing
  - Accuracy on complex movements
  - Generalizability to different landscape



# Mosaics from Forward Movement



ASIFT



UDH



rUDH



CorNet

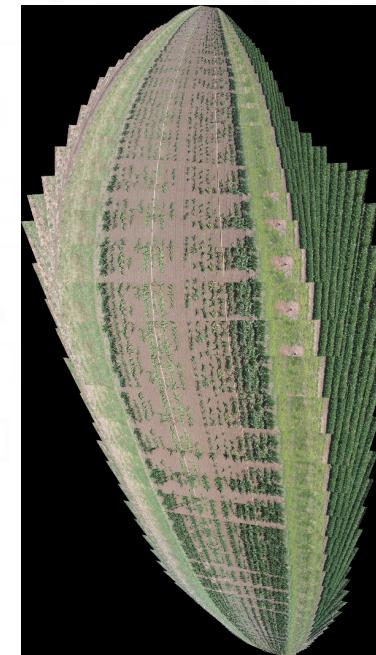
# Mosaics from Backward Movements



Ground truth



ASIFT  
0.9613



UDH  
0.7034

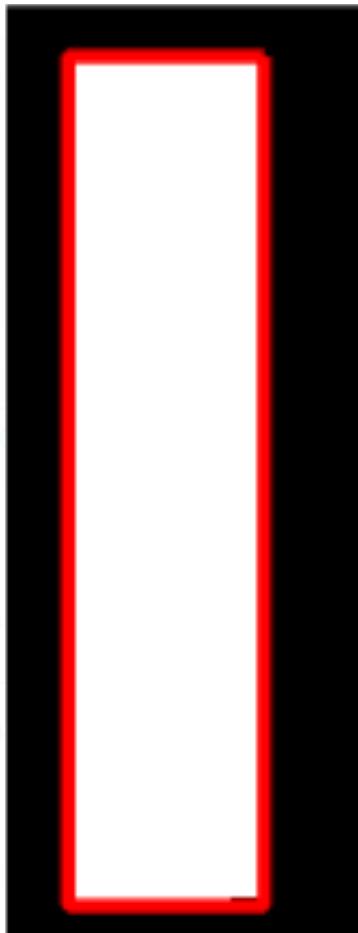


rUDH  
0.8428



CorNet  
0.9169

# Geometric Distortion Evaluation



Ground truth



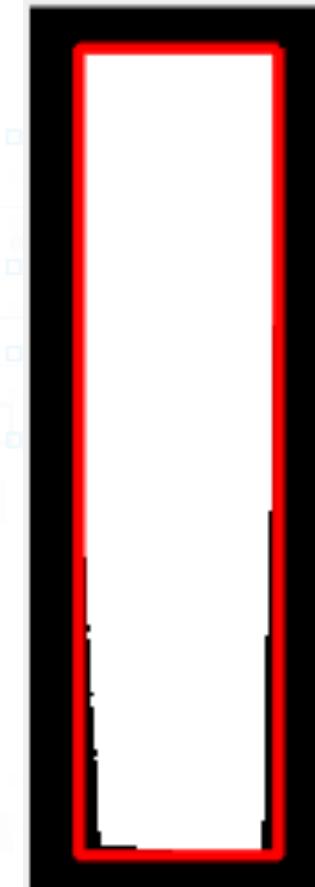
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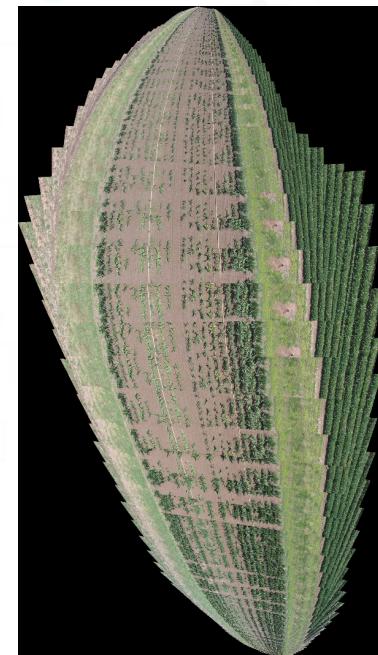
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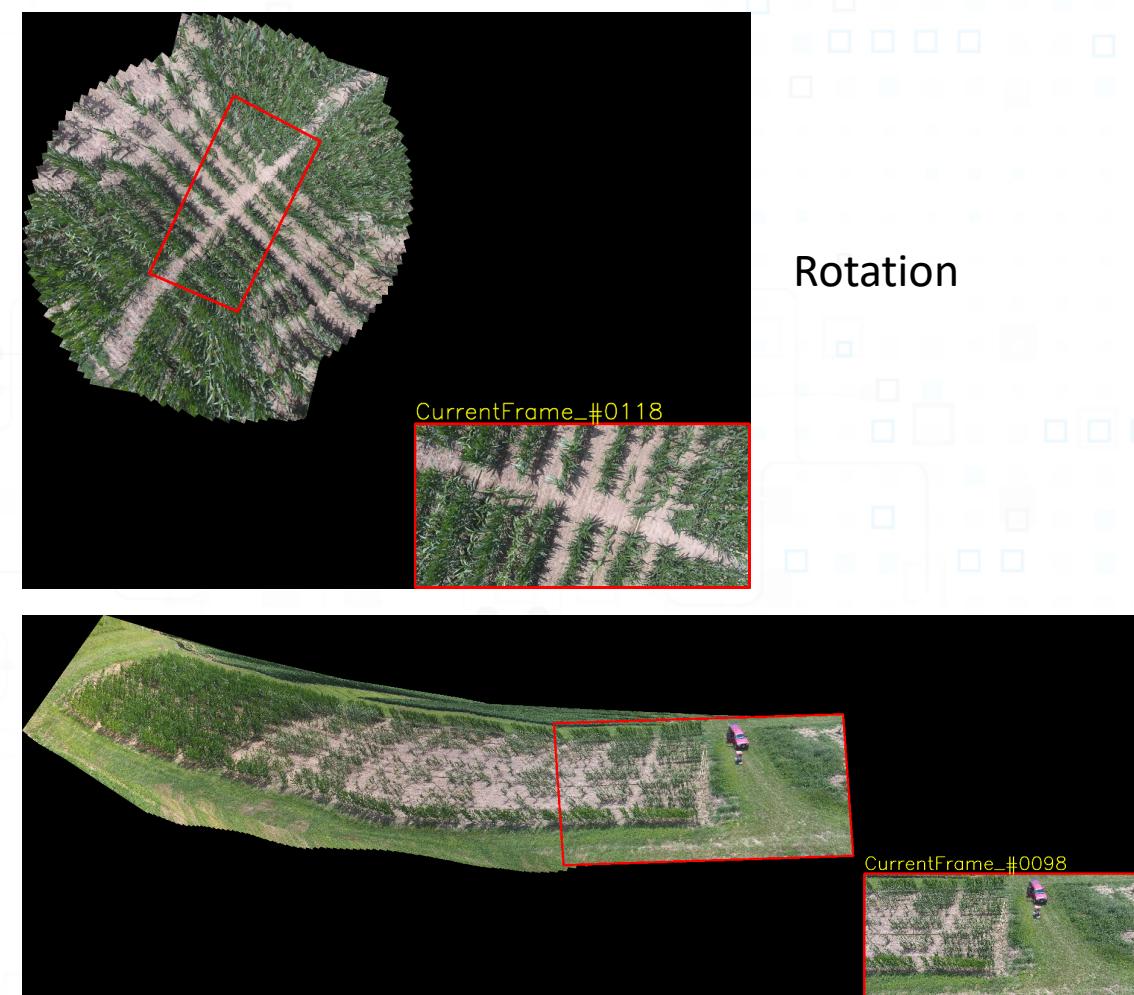
# CorNet with Different Movements



Forward

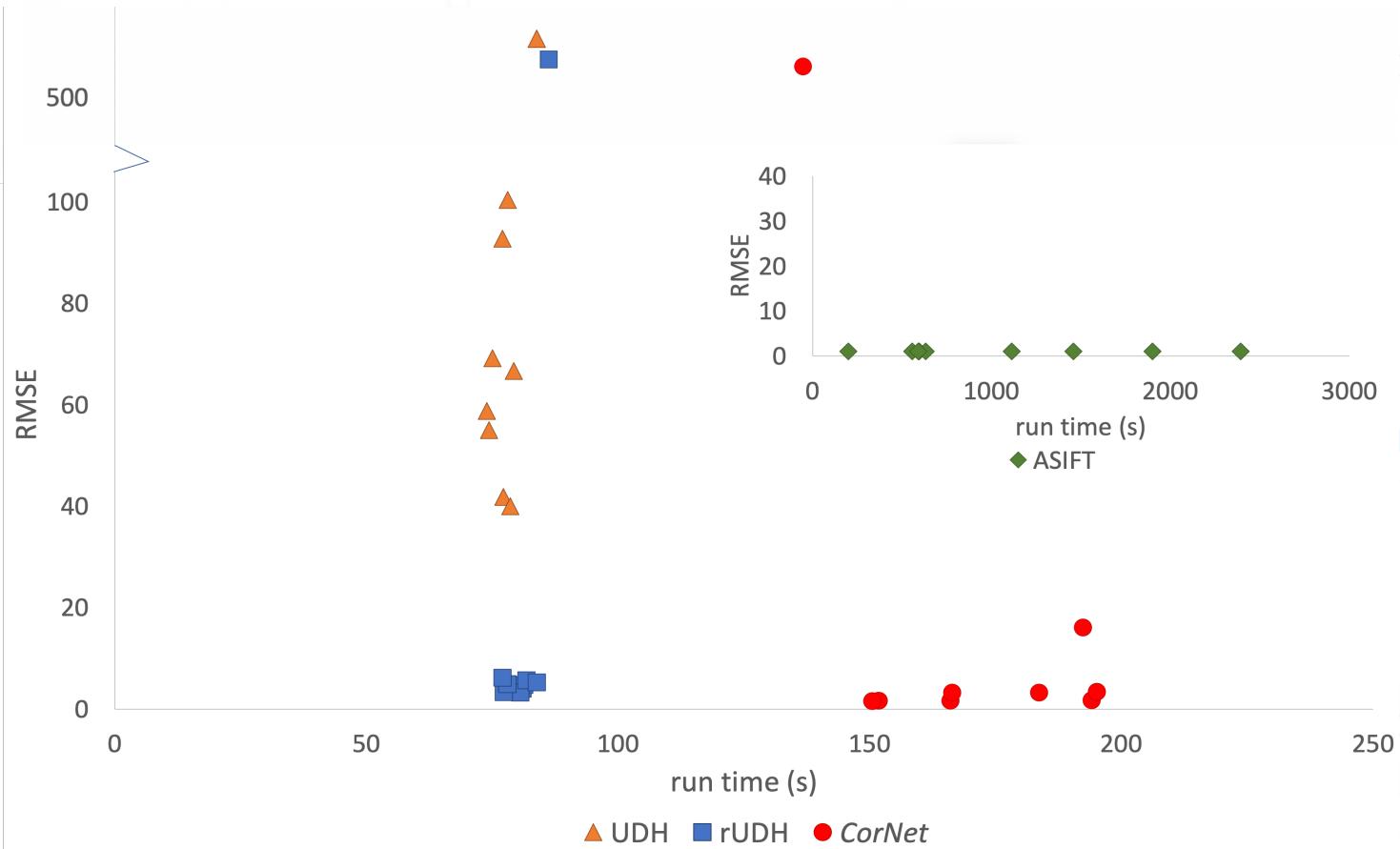
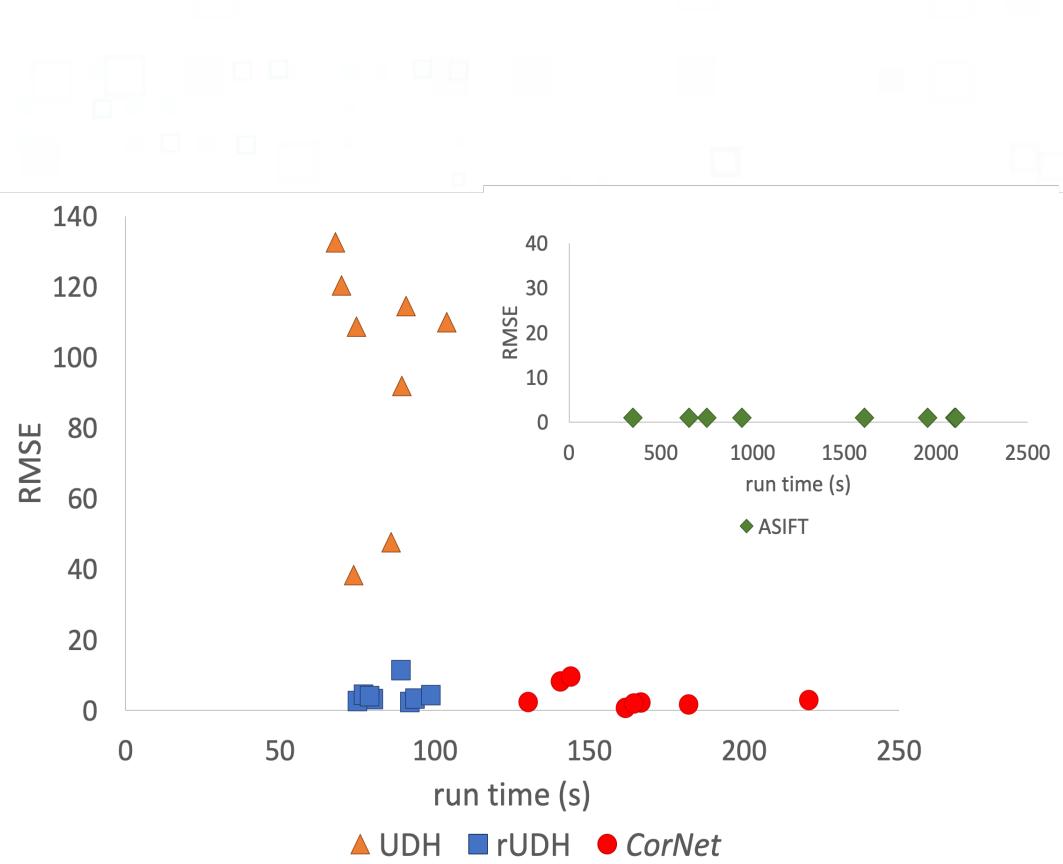


Backward



Orbit

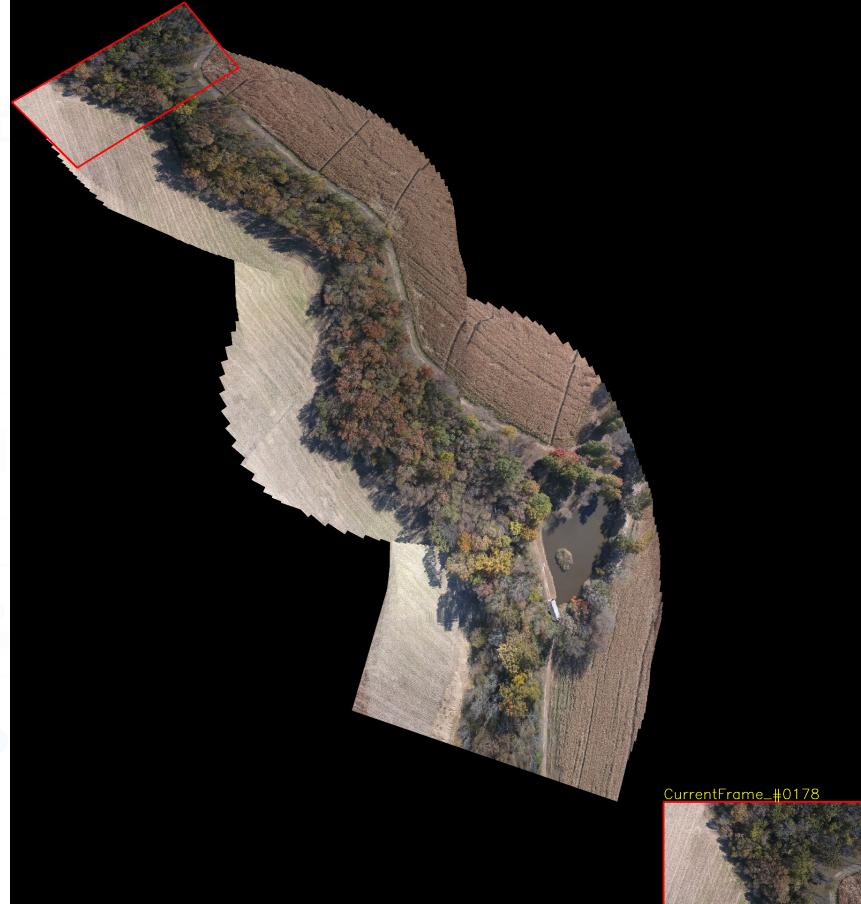
# Benchmarking Movements and Generalizability



# CorNet's Generalizability



UMDC, Dirt



Fall Forest



UMDC, Countryside

# Generalizability



Summer Forest



Farm Buildings



# Future Work

- More training data for rotations, scaling, and hovering
- Lens and gimbal correction from an object inside frame instead of a checkerboard
- Dynamic sampling for uniform overlap between frames
- Mini mosaicking algorithm to minimize error accumulation

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