Self-Supervised Joint Encoding of Motion and Appearance for First Person Action Recognition

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POLITECNICO
DI TORINO

Task Description

- First Person Action Recognition

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- First Person Action Recognition

- More challenging with respect to Third Person:
  - Ego-motion
  - Object Occlusions

Related Works

Two Stream Approach :

- Appearance Stream (RGB)
- Motion Stream (Optical/Warp Flow)

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2D Backbone + Recurrent Neural Network (RNN)

3D CNNs

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3D CNNs

Self-Supervision → Representation Learning (order prediction, odd-one-out, jigsaw3D, ..)

Our Contribution

A single stream architecture called SparNet

A set of motion prediction self-supervised pretext tasks in the specific domain of egocentric action recognition

- Motion Segmentation (MS)
- Optical Flow Classification (OFC)

Main Idea - Motion Prediction

GENERAL IDEA

APPLICATION

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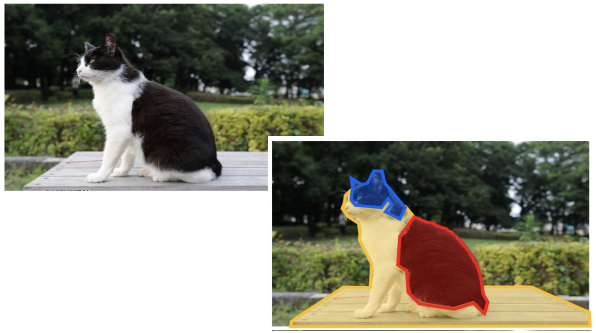
Main Idea - Motion Prediction

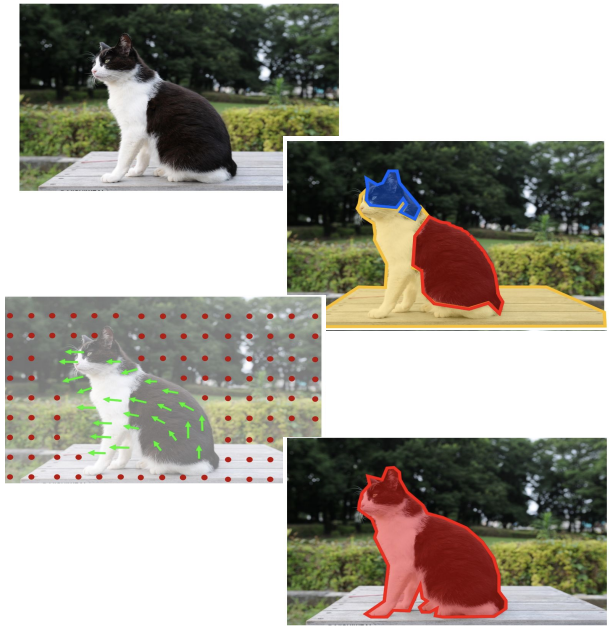
GENERAL IDEA



APPLICATION

Main Idea - Motion Prediction

GENERAL IDEA



APPLICATION

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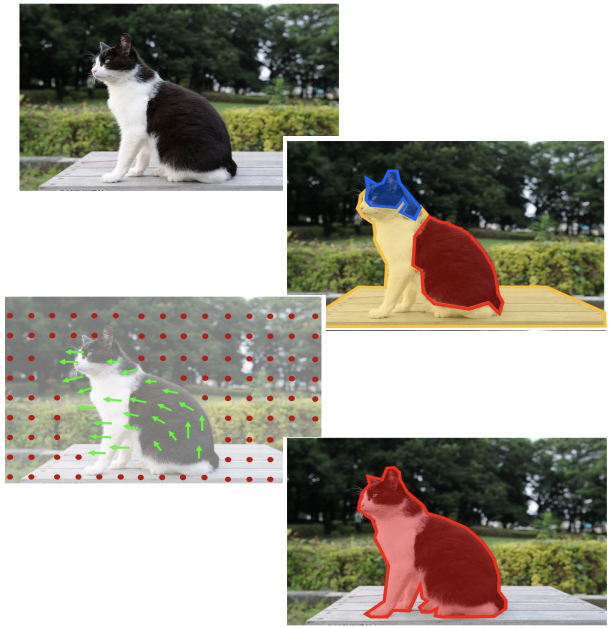

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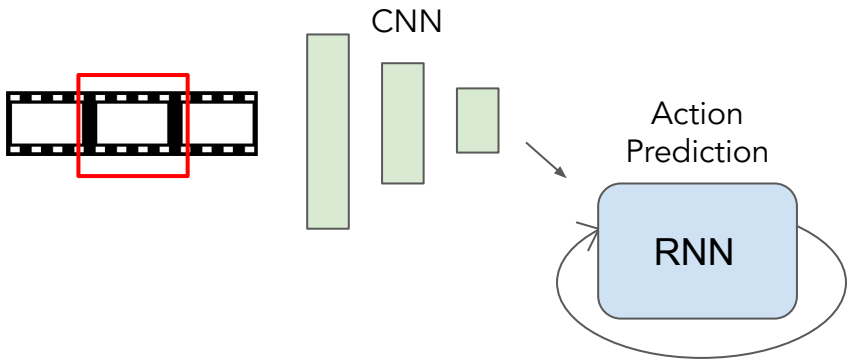

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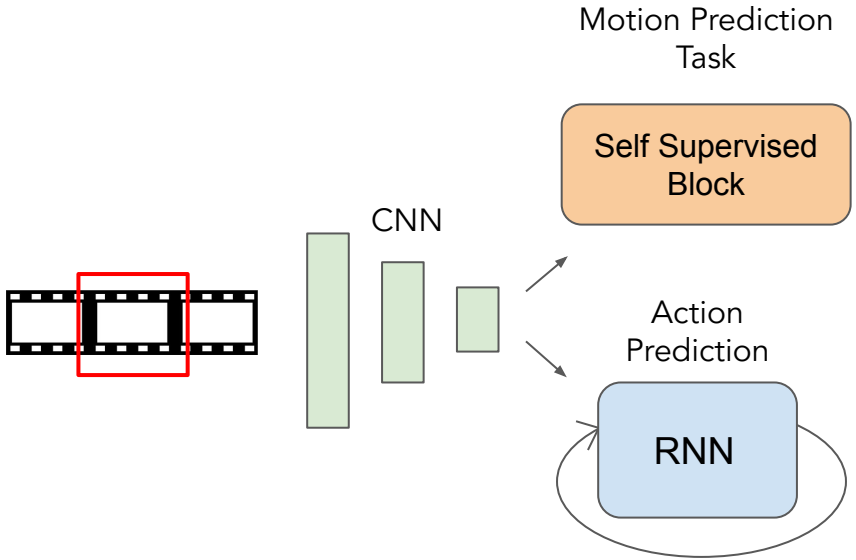


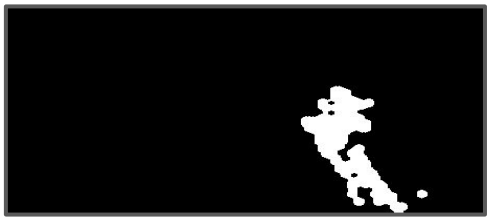
Motion-based Self-Supervised Tasks

Motion Segmentation (MS)

Optical Flow Classification (OFC)

Motion-based Self-Supervised Tasks

IDT[3]

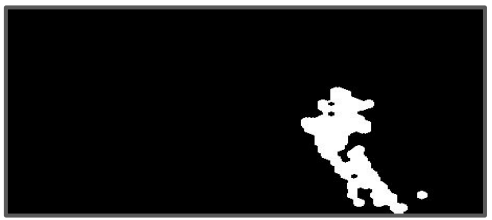


Motion: Yes or No?

Optical Flow Classification (OFC)

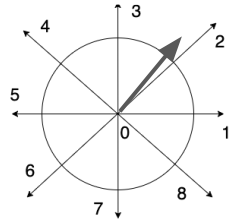
Motion-based Self-Supervised Tasks

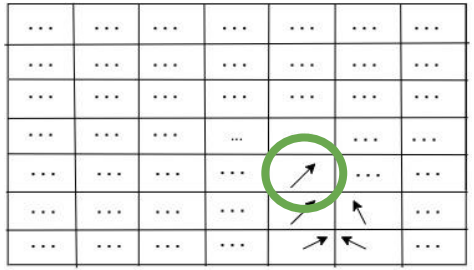
IDT[3]

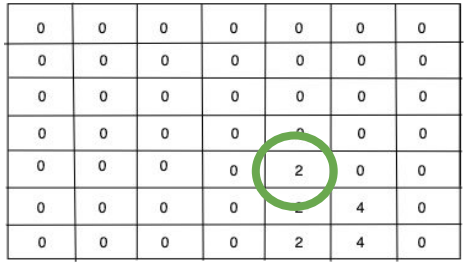


Motion: Yes or No?

Label Rules







Results - GTEA61

Method	GTEA-61
EleAttG[5]	66.77
TSN[6]	69.93
Ma et al.[7]	73.02
Ego-RNN[1]	79.00
LSTA[4]	80.01
SparNet-MS	80.51
SparNet-OFC	81.17
SparNet-MS-OFC	**81.39**

GTEA-61 (split2)	Single Stream (SS)	SS+MS	SS+OFC
Ego-RNN[1]	63.79	68.97	68.10
LSTA[4]	65.80	66.96	67.24

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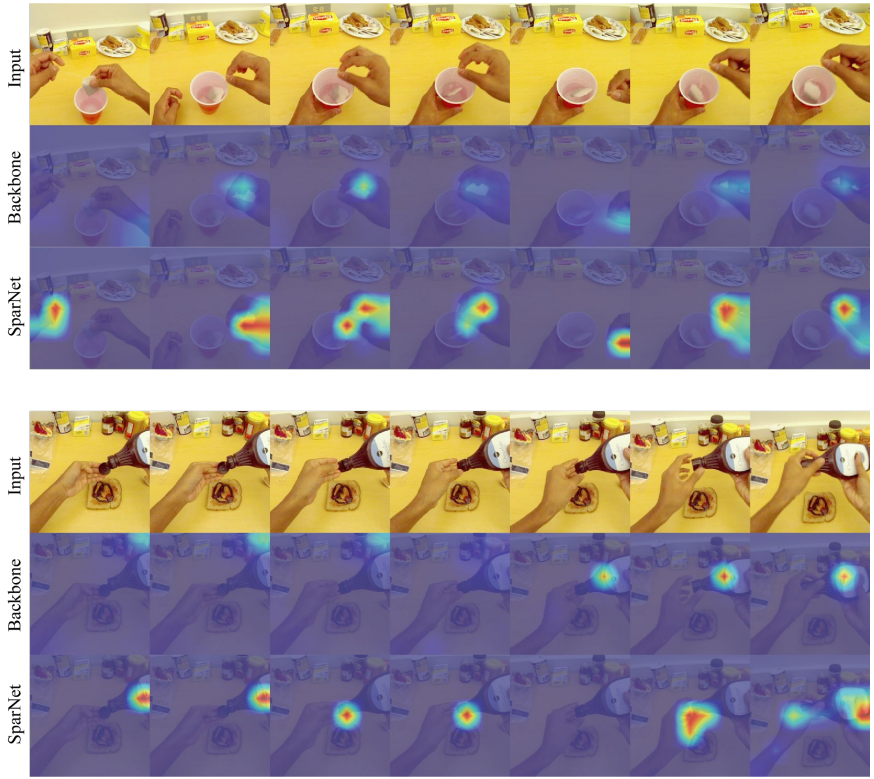
Results - EGTEA+ & FPHA

Method	EGTEA+
RULSTM[8]	60.20
Ego-RNN[1]	60.76
LSTA[4]	61.86
3DConv MTL[9]	65.70
Two-stream I3D + STAM[10]	65.97
SparNet-MS	66.15
SparNet-OFC	67.36
SparNet-MS-OFC	67.44
SparNet-MS-OFC (11Frames)	69.80

Method	FPHA
H+O[11]	82.43
Gram Matrix[12]	85.39
ST-TS-HGR-NET[13]	93.22
SparNet-MS	96.41
SparNet-OFC	96.41
SparNet-MS-OFC	96.70

Qualitative Results



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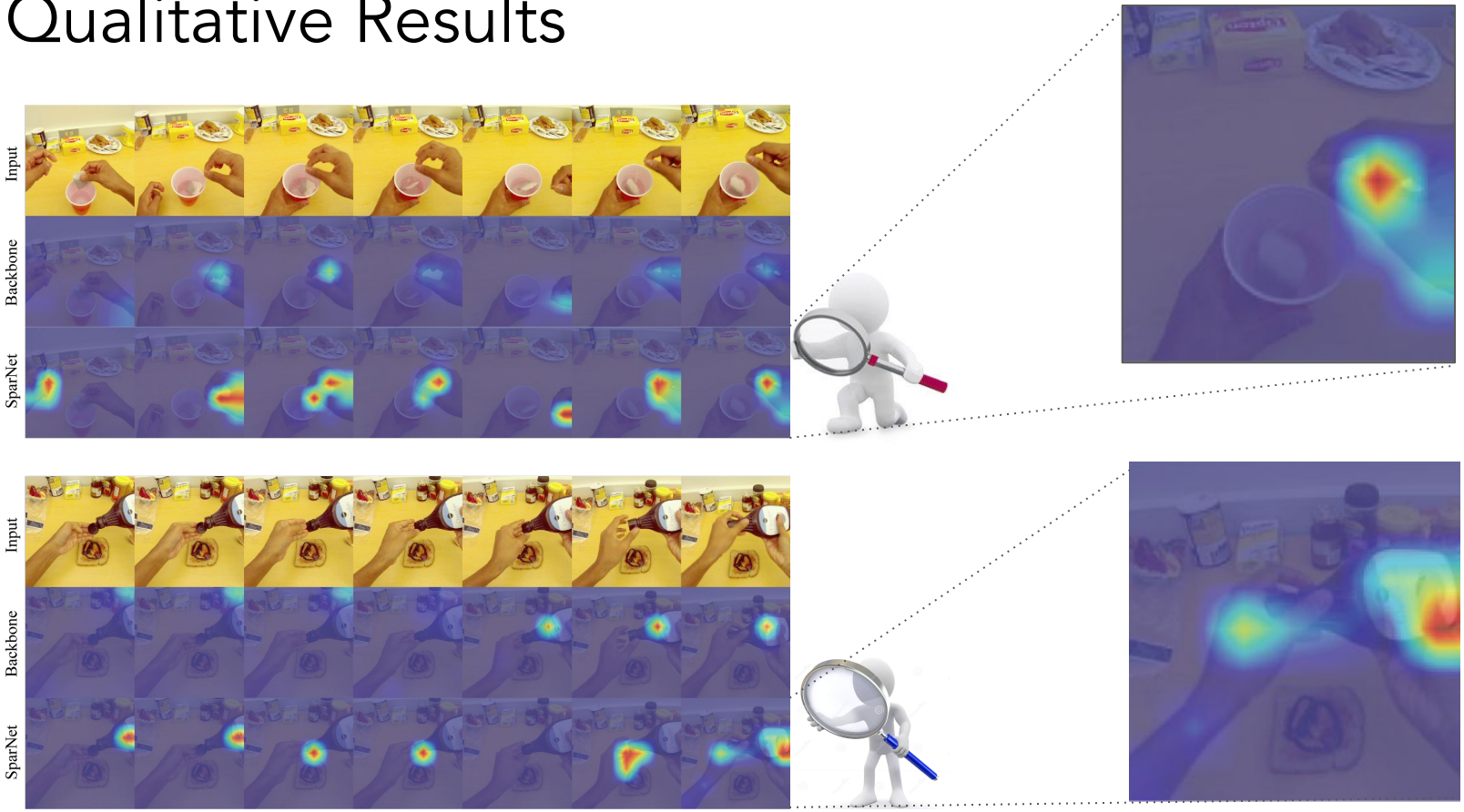

Conclusion

We propose a motion prediction self-supervised pretext tasks in the context of first person action recognition.

We validate our approach on several datasets.

SparNet obtained comparable results respect to the standard two stream approach, without using the Optical Flow information at test time.

Thank you!
Any questions?

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