## **TIMECEPTION** FOR COMPLEX ACTION RECOGNITION



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PROBLEM

#### **Problem** Complex Actions





#### **Problem** Complex Actions



#### Preparing Breakfast

**Complex Action** 



Stirring Food

One-action

#### **Problem** Complex Actions



#### Preparing Breakfast

**Complex Action** 

# 1. Long-range 2. Temporal Extent

#### 3. Temporal Dependency

#### Problem 1. Long-range



#### **Problem** 1. Long-range



#### **Problem 2. Temporal Extent**









#### **Problem 2. Temporal Extent**







#### **Problem** 3. Temporal Dependency



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#### **Problem** 3. Temporal Dependency







METHOD













![](_page_19_Figure_0.jpeg)

![](_page_20_Figure_0.jpeg)

![](_page_21_Figure_0.jpeg)

#### Method Efficiency

![](_page_22_Figure_1.jpeg)

Model Overview

**Timeception Layer** 

![](_page_23_Figure_0.jpeg)

**Timeception Layer** 

![](_page_24_Figure_0.jpeg)

**Timeception Layer** 

![](_page_25_Figure_0.jpeg)

![](_page_26_Figure_0.jpeg)

![](_page_27_Figure_0.jpeg)

#### Method Timeception

![](_page_28_Figure_1.jpeg)

![](_page_29_Figure_0.jpeg)

![](_page_30_Figure_0.jpeg)

![](_page_31_Figure_1.jpeg)

![](_page_32_Figure_1.jpeg)

**Temporal Convolution** 

Multi-scale Kernels

![](_page_33_Figure_1.jpeg)

#### Temporal Conv Module

![](_page_34_Figure_1.jpeg)

Temporal Conv Module

![](_page_35_Figure_0.jpeg)

![](_page_36_Figure_0.jpeg)

RESULTS

#### **Results** Charades Dataset

![](_page_38_Figure_1.jpeg)

![](_page_39_Figure_0.jpeg)

### **Results Temporal Footprint** 1024 **10x** frames TC NL 128 I3D 64

![](_page_41_Figure_0.jpeg)

![](_page_42_Figure_0.jpeg)

![](_page_43_Figure_0.jpeg)

![](_page_44_Figure_0.jpeg)

ANALYSIS

#### Analysis Multi-scale

Multi-scale Kernels

![](_page_46_Picture_2.jpeg)

#### Analysis Multi-scale

![](_page_47_Figure_1.jpeg)

![](_page_48_Figure_0.jpeg)

![](_page_48_Figure_1.jpeg)

![](_page_49_Figure_0.jpeg)

![](_page_49_Figure_1.jpeg)

- sit on table, hold paper, work on paper
  - wash cup, glass, bottle, dish –
- open fridge, get something, close fridge
- taking shoes, walking through doorway
  - take clothes, tidy clothes, put clothes
  - take blanket, tidy blanket, put blanket

    - sit on chair, take cup/glass/bottle
    - opening a window, close window

![](_page_50_Figure_0.jpeg)

![](_page_50_Figure_1.jpeg)

![](_page_51_Figure_0.jpeg)

![](_page_51_Figure_1.jpeg)

#### Analysis Long-range

Long-range

![](_page_52_Picture_2.jpeg)

#### Analysis Long-range

![](_page_53_Figure_1.jpeg)

#### **Analysis** Long-range

![](_page_54_Figure_1.jpeg)

![](_page_55_Figure_0.jpeg)

![](_page_55_Figure_1.jpeg)

![](_page_56_Figure_0.jpeg)

![](_page_56_Figure_1.jpeg)

#### CONCLUSION

![](_page_57_Figure_1.jpeg)

#### *"The whole is more than the sum of its parts" – Aristotle*