# **VideoCapsuleNet: A Simplified Network for Action Detection (Summary)**

## Abstract

The main subject of the paper is **Action Detection**. The paper mainly used **Capsules** in their network to address this problem. Their network results **pixel-wise action segmentation** and **action classification**. The network is a generalized from 2D to 3D and that issued a problem of increasing the network parameters then the network has been a computationally expensive. They addressed the previous issue with **Capsule-Pooling.**

## Introduction

**Capsules** is one of the main parts used in VideoCapsuleNet, and we can define Capsules as a group of neurons which can model different or parts of entities. The network relies on **routing-by-agreement** as a routing algorithm between capsules. One of the advantages of the capsules is that **viewpoint invariant.** The network also used 3D convolutions. In general, the network aims to learn the **semantic information** necessary for action detection.

## Generalizing Capsules to higher dimensional inputs

Each capsule consists of **2 main units**, the **pose matrix (M)** and the **activation probability (a).** The pose matrix contains **the instantiation parameters or the properties of the entity**. On the other hand, the activation probability is a **scalar between (0-1)** that present **the existence of the entity**. **Votes** between each 2 capsules are casting **using the transformation matrix** as follow:

This vote **employing the transformation matrix Mj for capsule** j in the next layer.

Generally, in Capsule networks, they **reduce** the number of computations by **only compute votes for capsules within a local respective field**. But in this paper, they introduced **2 new methods**, first one: they **share transformation matrice**s between capsules of the same type. Since they model the same entity so their votes should not vary based on their positions. Second one: they only apply **transformation matrix on the mean of the capsules in the respective field of each capsule type**.