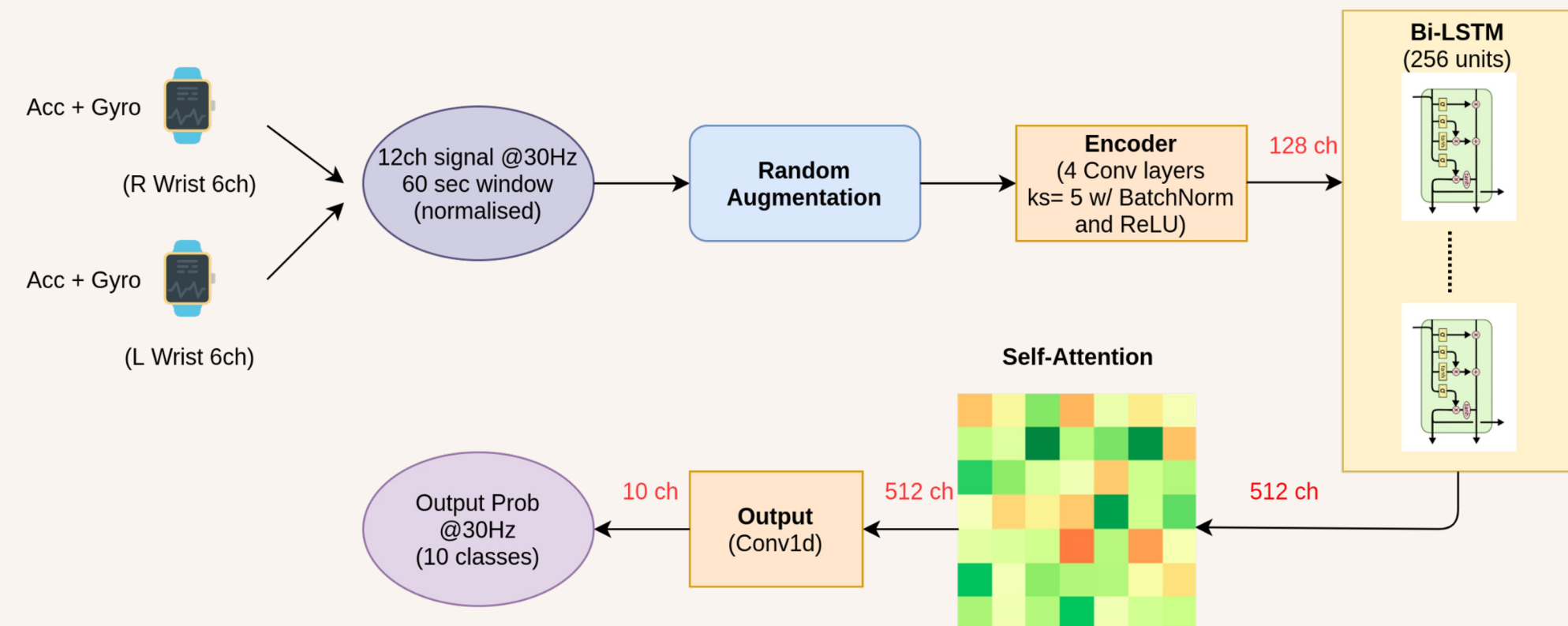# Precise Human Activity Recognition For The OpenPack Challenge 2022

Shubham M Wagh (Veridium UK) – Team Shubham Wagh
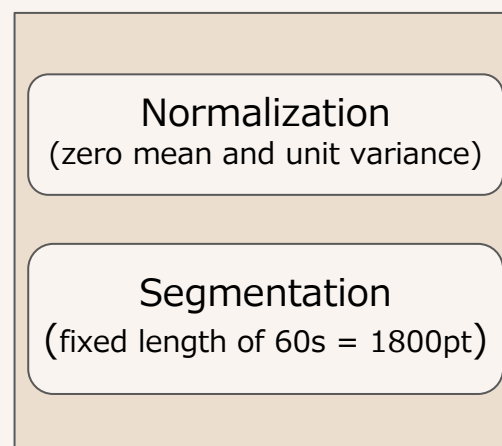
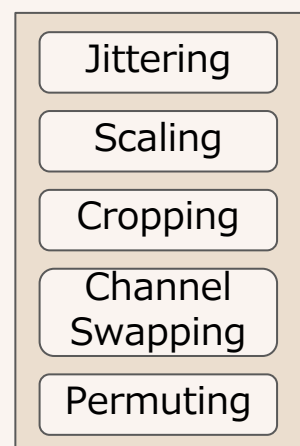**5th Place**

Method Overview

- **Proposed model uses data from IMU sensors on wrists to analyze acceleration and gyroscope signals.**

- **Signals are combined, normalized, and segmented into 60-second windows with random augmentation.**

- **Segments are processed to capture spatio-temporal features and learn essential time points.**

- **Self-attention mechanism used to understand relationships between different time points.**

Preprocessin

Normalization
(zero mean and unit variance)

Segmentation
(fixed length of 60s = 1800pt)

Augmentation

Jittering

Scaling

Cropping

Channel Swapping

Permuting

Results

- Self-attention mechanism with random augmentation has the greatest impact on recognition accuracy.

- Results in an increase of up to **0.0413 in F1 measure** (macro; All) compared to using no attention and augmentation.

- F1 measure of U0104 is not significantly affected by the use of self-attention with or without random augmentation, likely due to their slow and easy-to-identify movements as a beginner level user.

- **Best result:** recognition accuracy of **91.12%** (F1 Macro Avg.) using attention mechanism and data augmentation.

Model	F1 (Macro Avg.)							F1 (Weighted Avg.)
	U0104	U0108	U0110	U0203	U0204	U0207	All	All
DeepConvLSTM w/o attention	0.8961	0.9110	0.8268	0.9074	0.7397	0.7961	0.8699	0.8813
DeepConvLSTM w/ attention	0.9362	0.9140	0.8869	0.9160	0.7994	0.8589	0.8963	0.9048
DeepConvLSTM w/ attention & augmentation	**0.9384**	**0.9204**	**0.9104**	**0.9263**	**0.8101**	**0.8673**	**0.9112**	**0.9221**