Estimation of Clinical Tremor using ST-AAE

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Spatio-Temporal Adversarial AutoEncoder (ST-AAE)

Cross-Validation on Volunteer Data ROC Curves

ROC curve of class 0 (area = 0.97)

ROC curve of class 1 (area = 0.98)
ROC curve of class 2 (area = 0.97)

micro-average ROC curve (area = 0.97)

0.8

1.0

0.6

False Positive Rate

Normalized Confusion Matrix

0.04

0.05

Fredicted label

0.4

1.0

0.8

BACKGROUND

- Clinical Tremor
 - Rhythmic, involuntary
 - oscillatory movement
 - Diagnostic feature of multiple
 - central system disorder
 - Parkinson's disease
 - Essential tremor
 - Medication side effect

 Monitor across diverse population with limited mobility

 Clear value in automated methods for remote assessments

WHY ST-AAE?

•Limitation of hand detection and tracking

- Bounded by accuracy and robustness of underlying detection
- Motion blurring, occlusions, and/or complex hand poses • End-to-end training frameworks should be more suitable
- Data collection challenges
- Large amount data requires major effort, or not possible • Intra- or inter- observer variability
- Spatio-temporal adversarial autoencoder (ST-AAE)
- Integrates spatial and temporal information

100

80

70

60

50

40

30

20

10

Basic

🔲 + Weight Initialize

+ Image Augment

+ AAE Generator

Subject 1

+ AAE w/o Discriminator

Subject 2

Subject 3

Subject 4

Subject 5

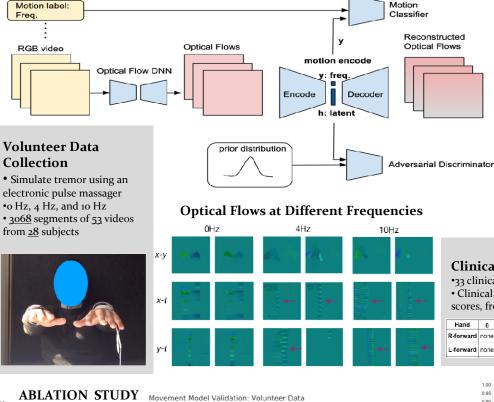
Subject 6

Subject 7

Subject 8

AVERAGE

- Adversarial generative
- subnetwork boosts learning
- 3D Optical extracts only motion





•33 clinical videos from 9 essential tremor patients Clinical videos were coupled with clinical TETRAS scores, from in-person and video-review

0.2

0.14

0.15

Hand	0	1	1.5	2	2.5	3	3.5	4
R-forward	none	barely visible	<1 cm	1- <3 cm	3- <5 cm	5- <10 cm	10-20 cm	>20 cm
L-forward	none	barely visible	<1 cm	1- <3 cm	3- <5 cm	5- <10 cm	10-20 cm	>20 cm

