

# The effect of limb position on myoelectric prosthetic control using linear regression

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DENMARK

# Agenda

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## ► Myoelectric prosthetics

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- ▶ Myoelectric prosthetics
- ▶ Variations in limb positions lower accuracy [1]

[1] Fougner et al. IEEE TNSRE (2011)

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- ▶ Myoelectric prosthetics
- ▶ Variations in limb positions lower accuracy [1]
- ▶ Classification [1] vs regression [2]

[1] Fougner et al. IEEE TNSRE (2011)  
[2] Hahne et al. IEEE TNSRE (2014)

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- ▶ Myoelectric prosthetics
- ▶ Variations in limb positions lower accuracy [1]
- ▶ Classification [1] vs regression [2]
- ▶ Test performance of linear regression- based control across different limb positions

[1] Fougner et al. IEEE TNSRE (2011)

[2] Hahne et al. IEEE TNSRE (2014)

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# Methods and Materials

## Wrist Movements

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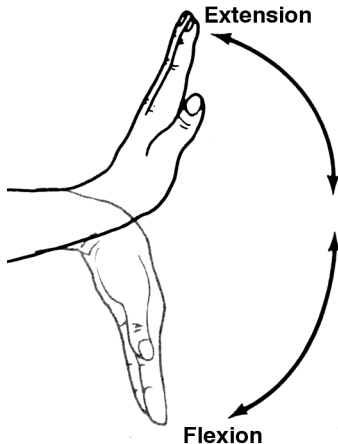
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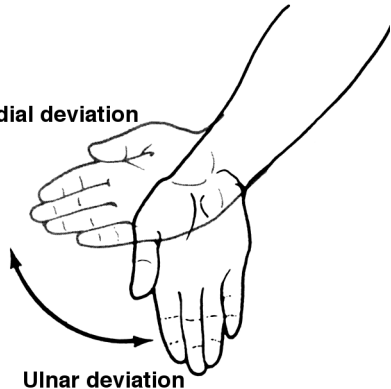
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Radial deviation



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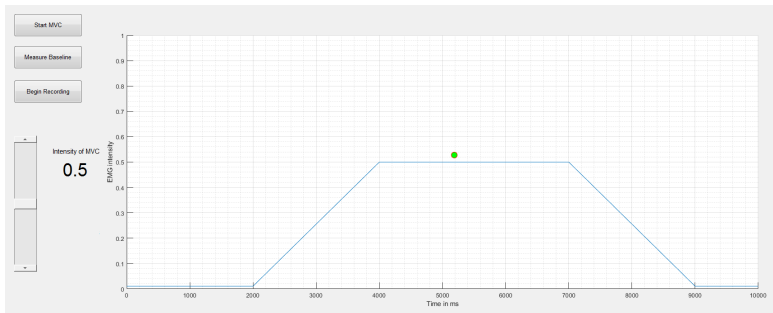
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# Methods and Materials

## Test GUI

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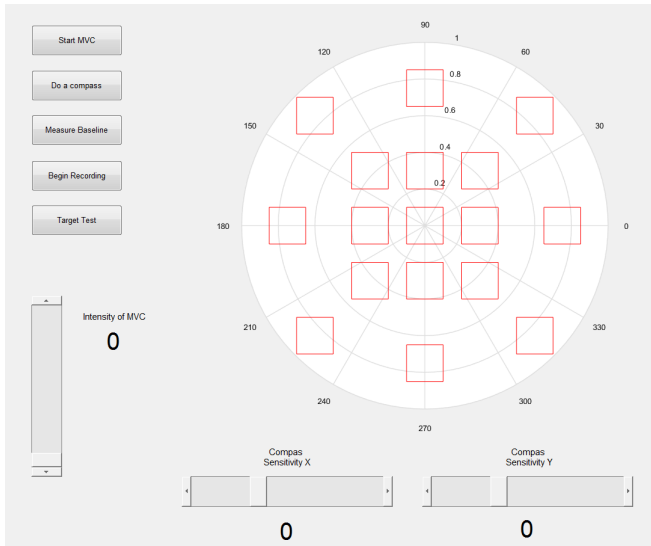
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# Results

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# Results

Offline Results: training data

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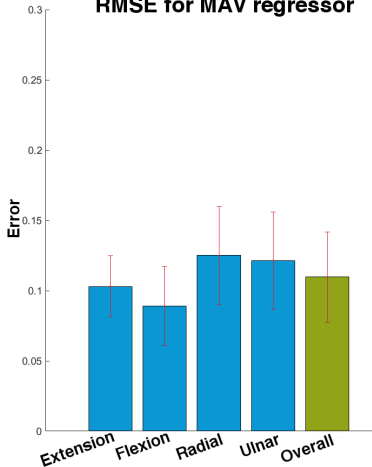
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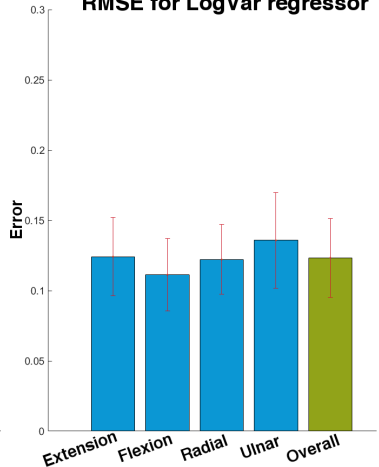
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**RMSE for MAV regressor**



**RMSE for LogVar regressor**



Significant difference between MAV and LogVar ( $p = 0.0007$ )

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Offline Results: test data

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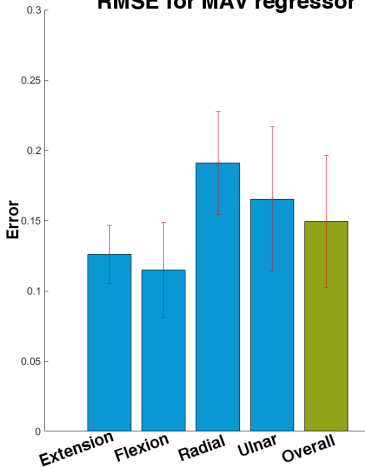
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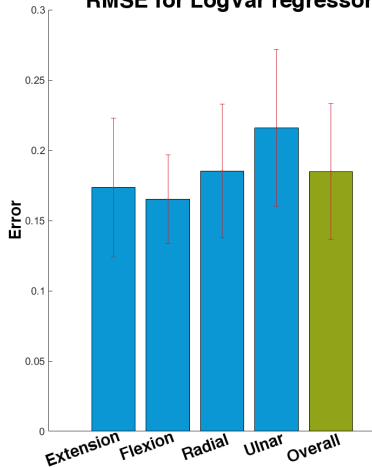
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**RMSE for MAV regressor**



**RMSE for LogVar regressor**



Significant difference between MAV and LogVar ( $p = 0.00082$ )

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## Offline Results: training VS test

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- ▶ Significant difference between MAV training and MAV test data ( $p = 0.0002$ )
- ▶ Significant difference between LogVar training and LogVar test data ( $p = 0.0002$ )

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## Online Results: MAV

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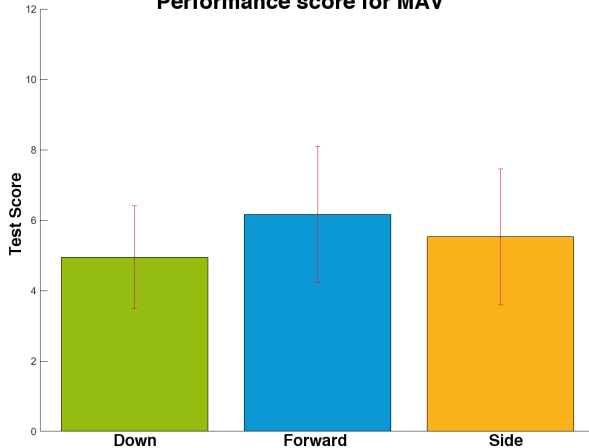
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### Performance score for MAV



No significant difference between limb positions ( $p = 0.16$ )

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## Online Results: LogVar

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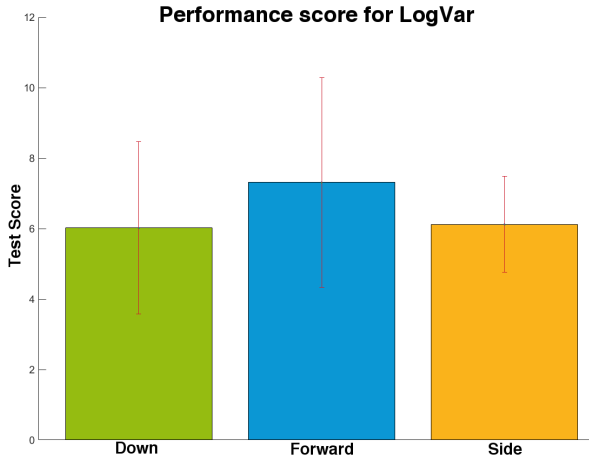
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No significant difference between limb positions ( $p = 0.56$ )

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# Results

## Online Results: feature comparison

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- No significant difference between MAV and LogVar ( $p = 0.13$ )

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- No significant difference in performance across limb positions

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- ▶ No significant difference in performance across limb positions
- ▶ No correlation between offline and online test

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- ▶ No significant difference in performance across limb positions
- ▶ No correlation between offline and online test
- ▶ No significant difference in performance between the MAV and LogVar feature

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- ▶ No significant difference in performance across limb positions
- ▶ No correlation between offline and online test
- ▶ No significant difference in performance between the MAV and LogVar feature
- ▶ Large potential in linear regression-based myoelectric prosthetic control

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# Acknowledgement

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- ▶ Supervisors: Strahinja Dosen, Jakob Dideriksen and Lotte Struijk
- ▶ SMH for providing equipment
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Thank you



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