



# Wait, Who's Flying This Thing?

A Learning Approach for UAV Operator Mode Classification

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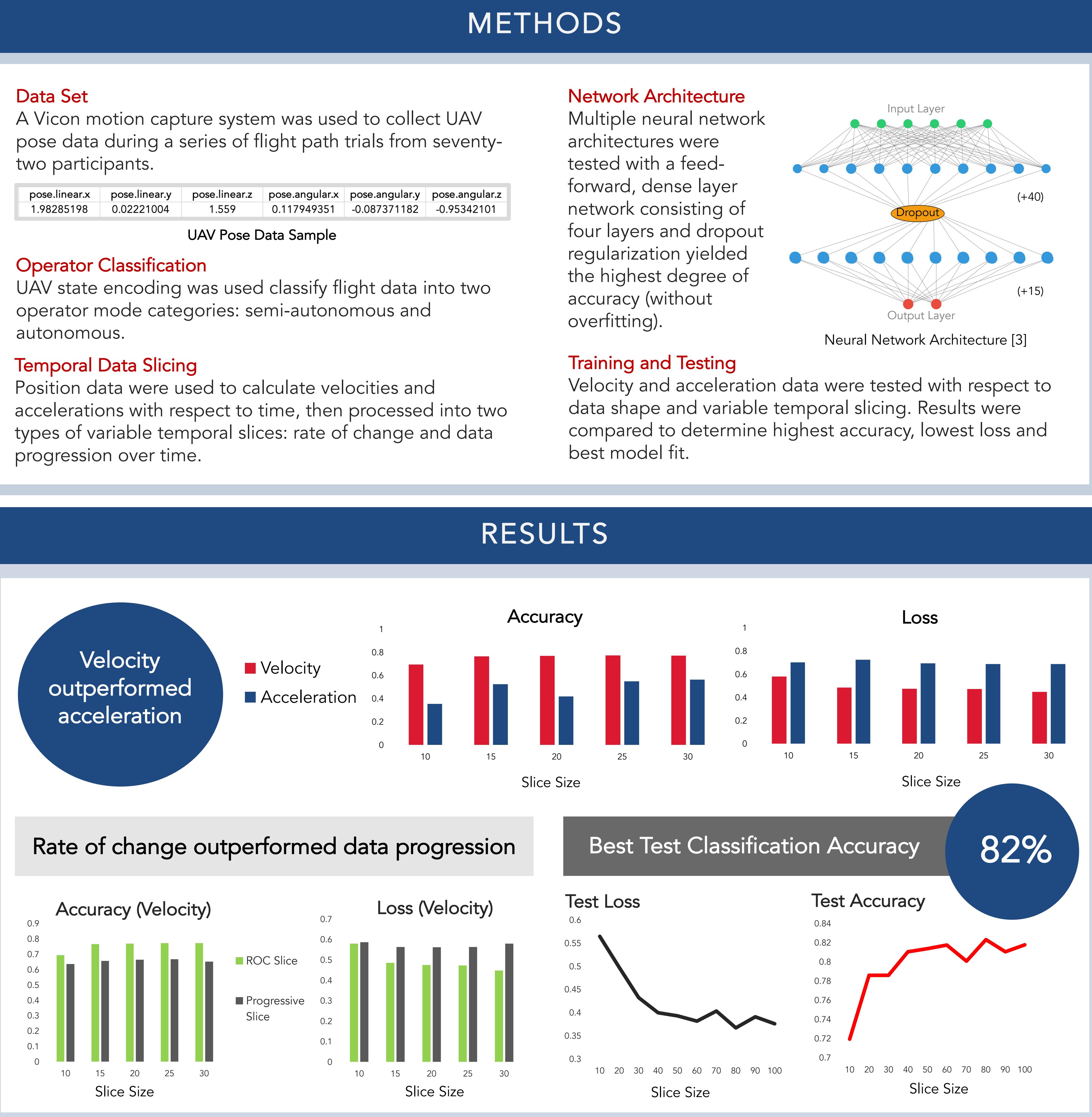
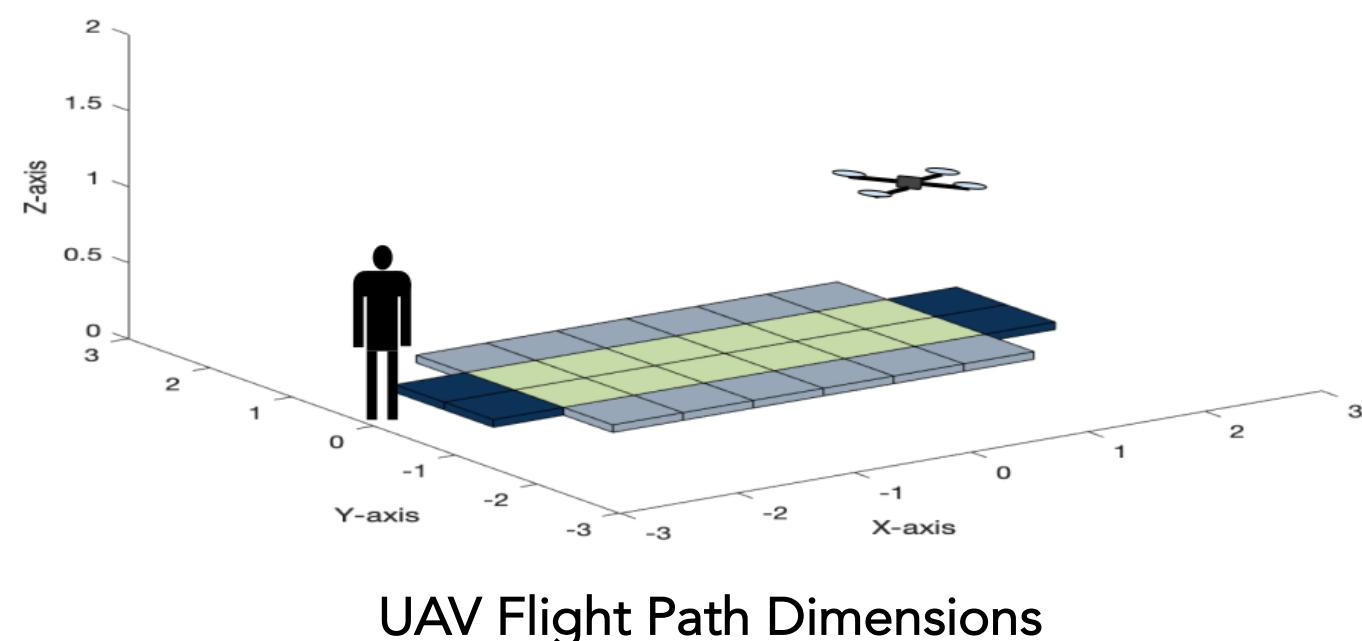
AscTec Hummingbird with Xbox control

## INTRODUCTION

- Flight behavior classification techniques may enable successful UAV integration in complex airspace environments [1].
- Operator mode classification may enable adaptation to differing flight behavior norms for manned, remote piloted, autonomous and semi-autonomous vehicles [2].
- Effective operator mode classification techniques may be possible with a machine learning strategy.

## GOAL

This study seeks to determine if a neural network can accurately classify operator mode (autonomous or piloted) through analysis of UAV flight path data.



## DISCUSSION

### Velocity and Acceleration

Calculating acceleration from initial position data may have generated a higher degree of abstraction, making it difficult for the network to identify trends based on acceleration

### Rate of Change and Progressive Slices

Progressive data slices showed small changes in pose, possibly making it more difficult for the neural network to identify behavior when compared to rate of change data slices

### Time to Classification

Highest classification accuracy can be achieved with sixteen seconds of data

## FUTURE DIRECTION

- Inclusion of manual flight control data help the neural network identify human influence
- Additional testing on datasets not associated with the original study may help determine generalizability
- State-of-the-art object detection algorithms such as YOLO may be integrated to capture and classify data on-the-fly

## REFERENCES

- [1] C. E. Lin and Y.-H. Lai, "UAV Path Prediction for CD&R to Manned Aircraft in a Confined Airspace for Cooperative Mission," *Int. J. Aerosp. Eng.*, vol. 2018, 2018.
- [2] A. Shoufan, H. M. Al-Angari, M. F. A. Sheikh, and E. Damiani, "Drone Pilot Identification by Classifying Radio-Control Signals," *IEEE Trans. Inf. Forensics Secur.*, vol. 13, no. 10, pp. 2439–2447, Oct. 2018.
- [3] T. Gheorghiu, ANN Visualizer. 2018.

## ACKNOWLEDGMENTS

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