

# MACHINE LEARNING FOR THE AUTOMATION OF OPTIC NERVE SHEATH DIAMETER MEASUREMENT: CURRENT PROGRESS AND FUTURE IMPLICATIONS FOR CREW AUTONOMY

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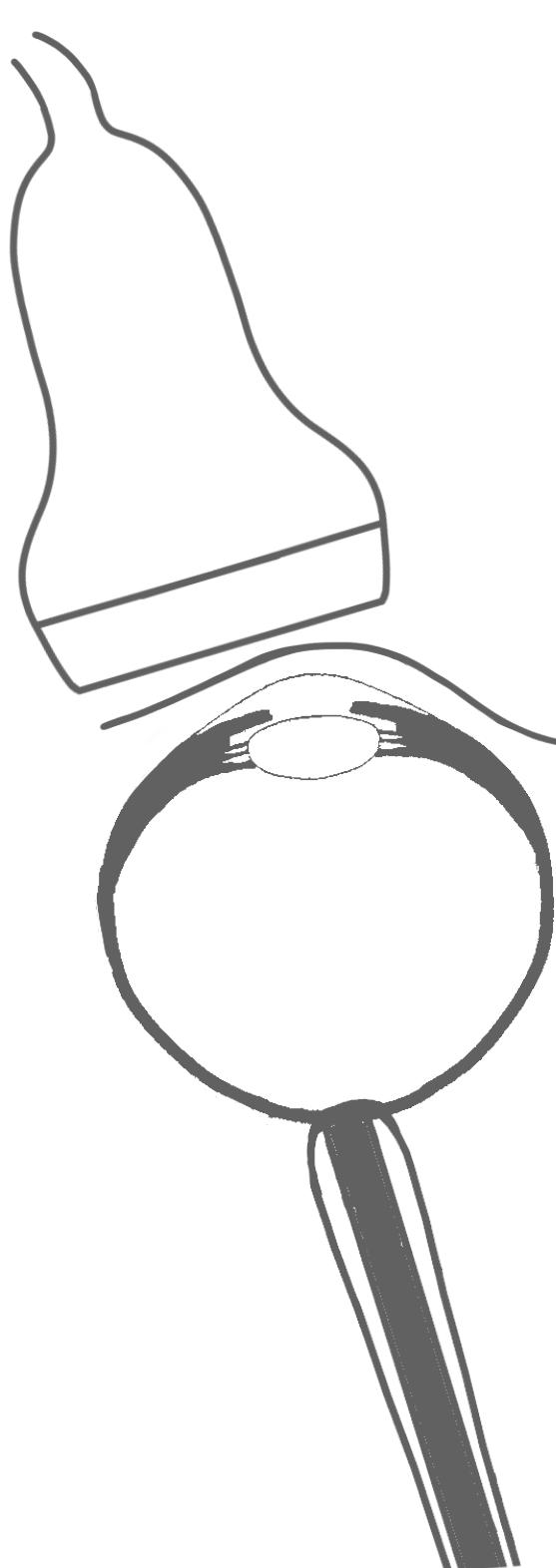
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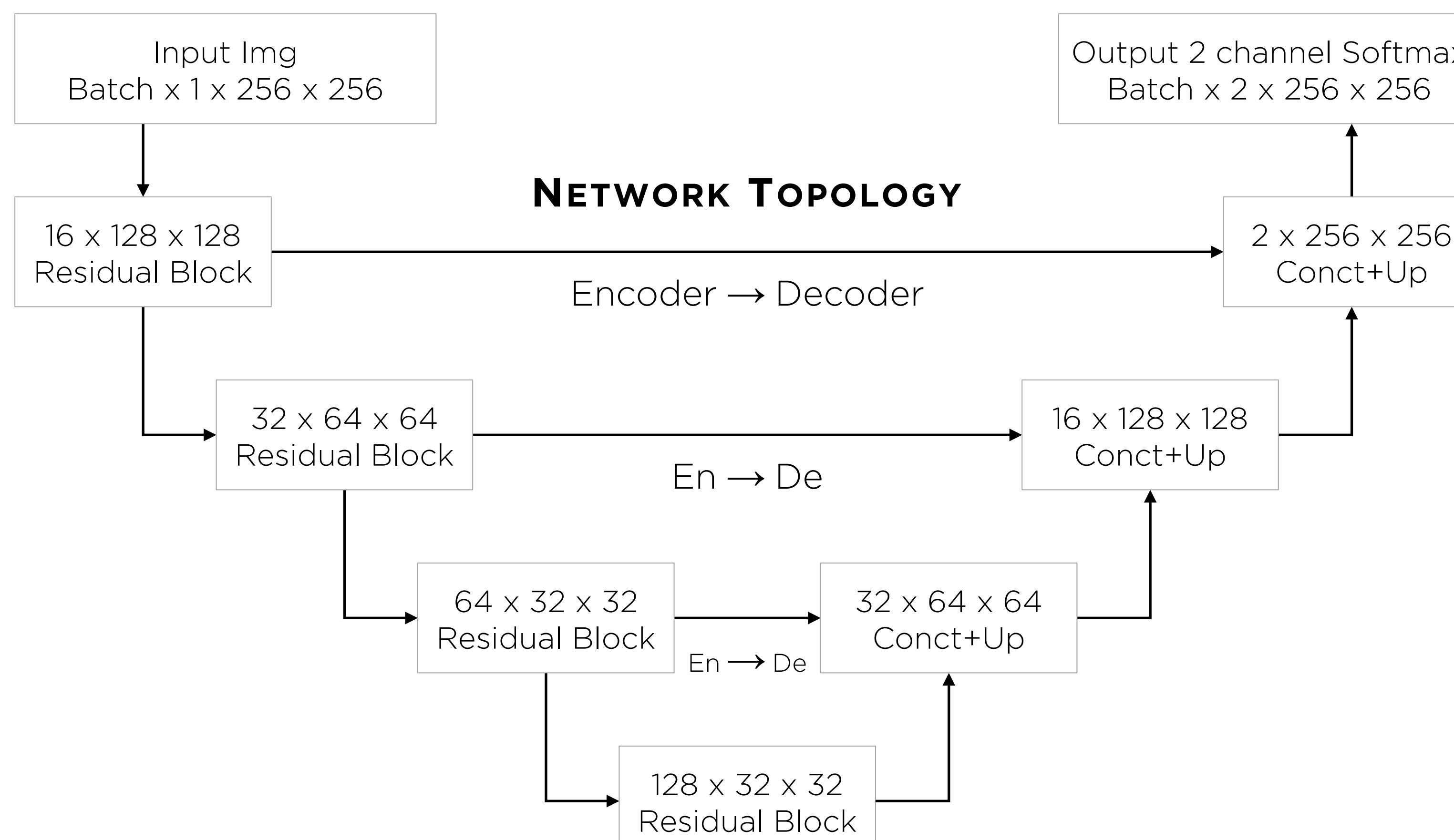
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## BACKGROUND

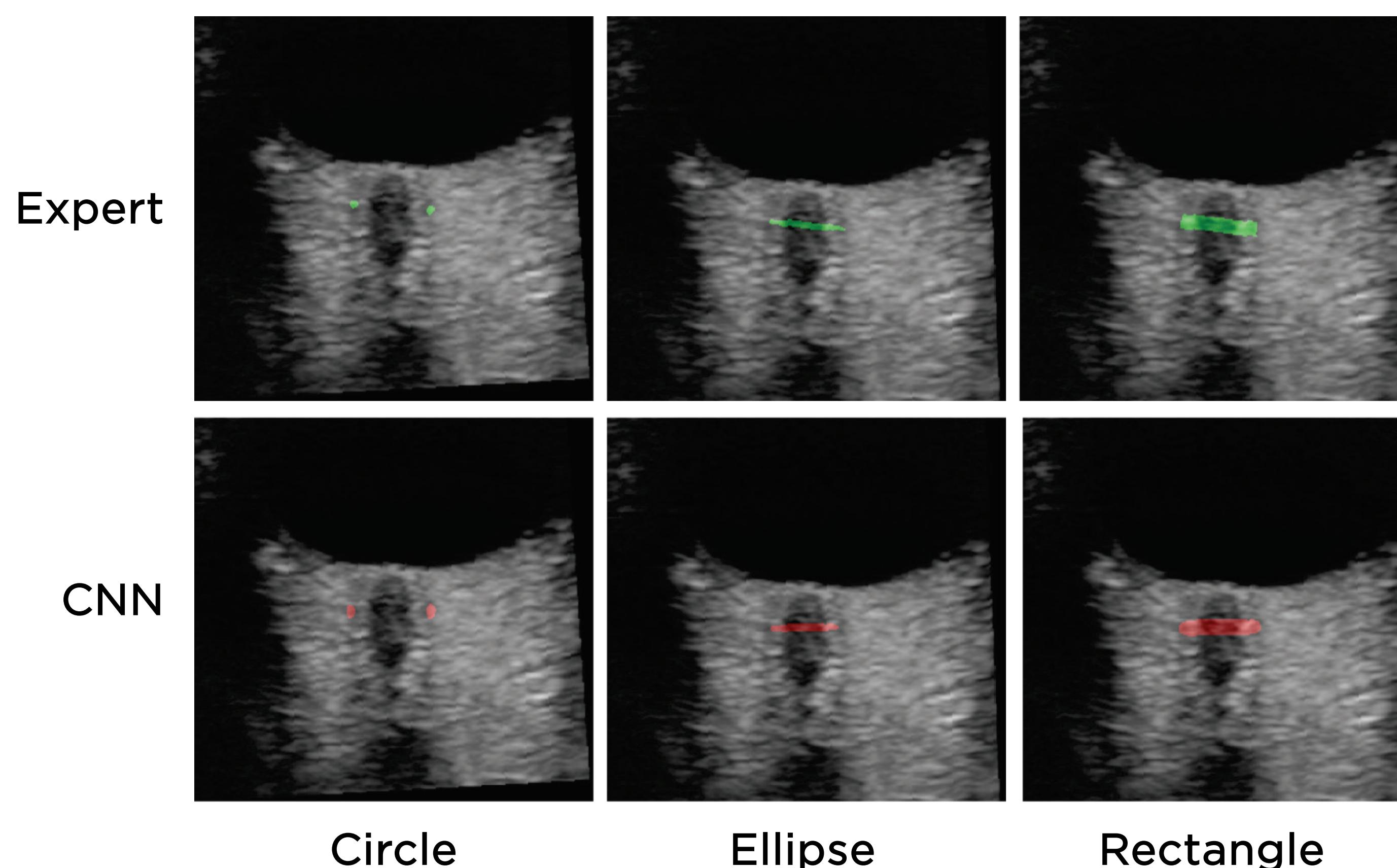
- Optic nerve sheath diameter (ONSD) is measured routinely in astronauts.
- ONSD measurement requires expert guidance and cannot be performed independently.
- We aim to automate ONSD ultrasound measurement to enhance crew autonomy in deep space missions.



## MONAI U-net used for automation.



The effect of different mask shapes marked by expert on machine learning performance was evaluated.

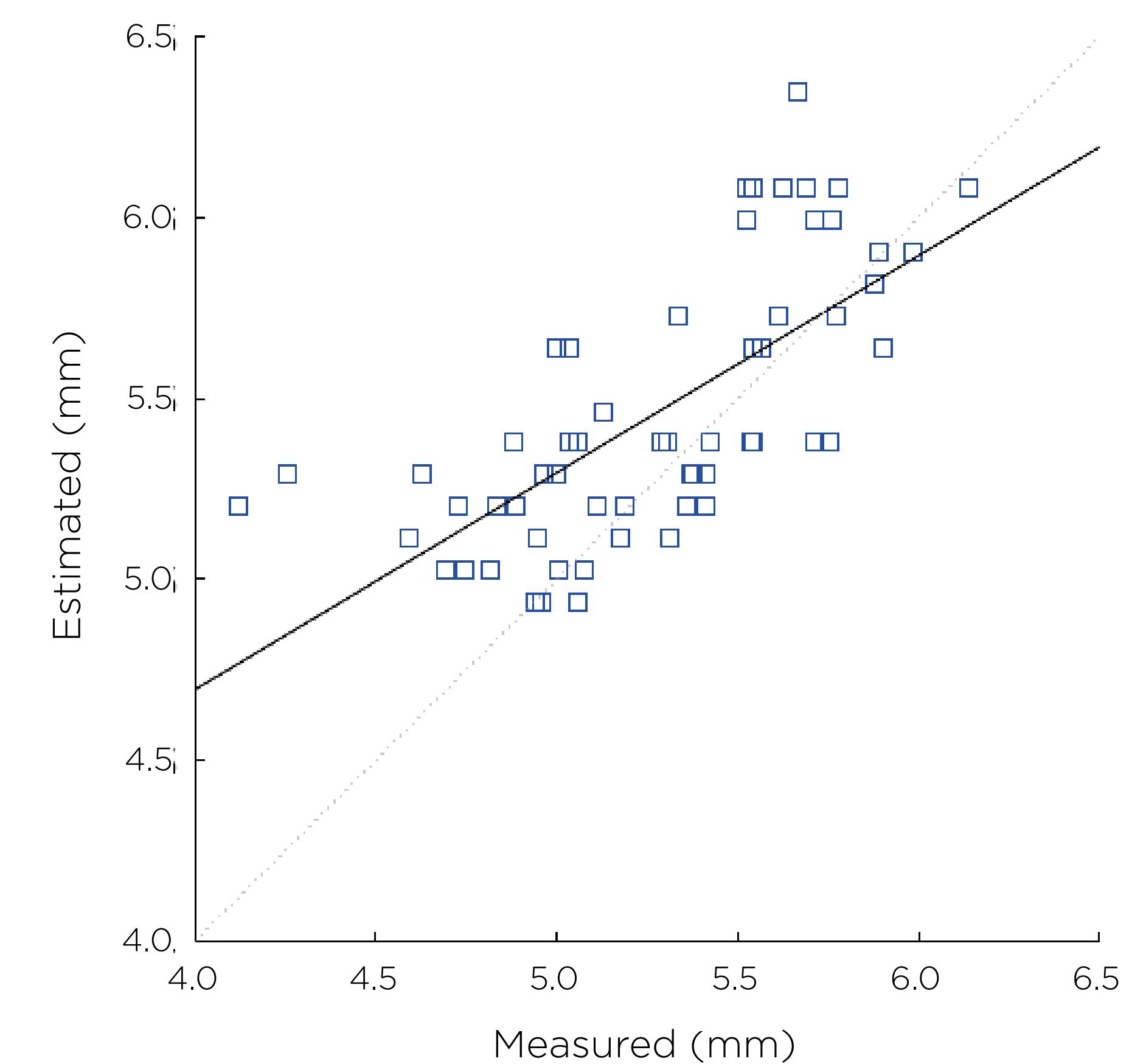


## METHODS

- 52 ultrasonography sessions with 873 images were acquired from 46 patients with brain injuries.
- The images were used to train an open source convoluted neural network, MONAI U-Net, (<https://monai.io>).

## RESULTS

- Strong correlation between expert and machine learning measurements ( $r = 0.7, p < 0.0001$ ).
- Expert Mean ONSD (SD) was 5.27 mm (0.43) compared to the mean machine learning measurement of 5.46 mm (0.37).
- The mean difference (95% CI,  $p$  value) was 0.19 mm (0.10–0.27mm,  $p < 0.0001$ ).
- Root mean square error (RMSE) = 0.27.



## CONCLUSION AND FUTURE DIRECTION

- Machine learning is feasible for ONSD automation.
- Important next steps include automating frame selection and diversifying the dataset with more experts, ultrasound machine, and populations.

