

GOING DEEPER WITH BRAIN MORPHOMETRY USING NEURAL NETWORKS

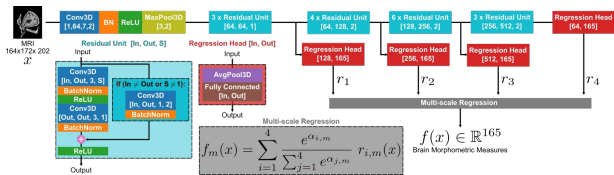
Rodrigo Santa Cruz^{1,2}, Léo Lebrat^{1,2}, Pierrick Bourgeat¹, Vincent Dore³, Jason Dowling¹, Jorgen Frupp¹, Clinton Fookes², and Olivier Salvado⁴

¹CSIRO Health and Biosecurity, The Australian eHealth Research Centre. ²Image and Video Laboratory QUT. ³Department of Nuclear Medicine and Centre for PET. ⁴CSIRO Data61, Australia.

This paper introduces **HerstonNet** an accurate and efficient neural network regression model for brain morphometry from MRI.

HerstonNet:

- predicts the volume of **29 subcortical structures** and the thickness and curvature of **68 cortical parcellations** directly from T1-w MRIs.
- has a **3D-ResNet architecture** with multiple regression “heads” to better predict brain morphometry of different structures.
- uses **Stochastic Weight Averaging (SWA)** to avoid bad local minimum reducing the prediction error variance and overfitting.



Results:

- Data: 9310 MRIs from ADNI and AIBL studies annotated with brain morphometry of FreeSurfer V6 pipeline.
- HerstonNet outperforms the existing approach by 24.30% in terms of intraclass correlation coefficient while maintaining a competitive run-time.

