

Identification of Chiasmal Malformations with Deep Learning Anomaly Detection

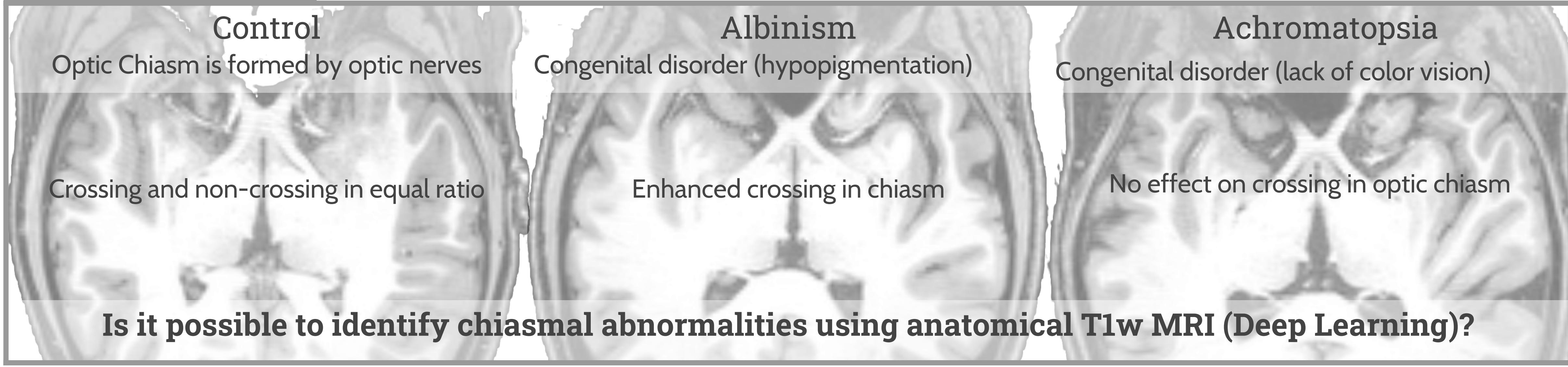
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Background



Is it possible to identify chiasmal abnormalities using anatomical T1w MRI (Deep Learning)?

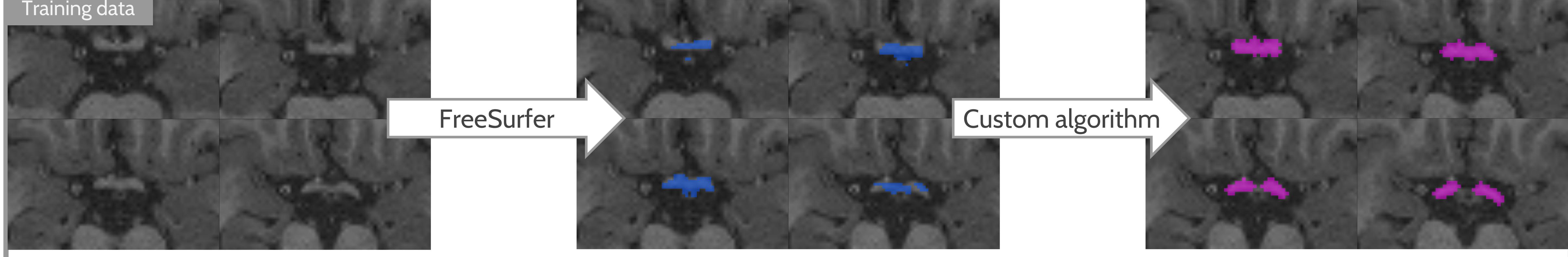
Methods

T1w MRI Data

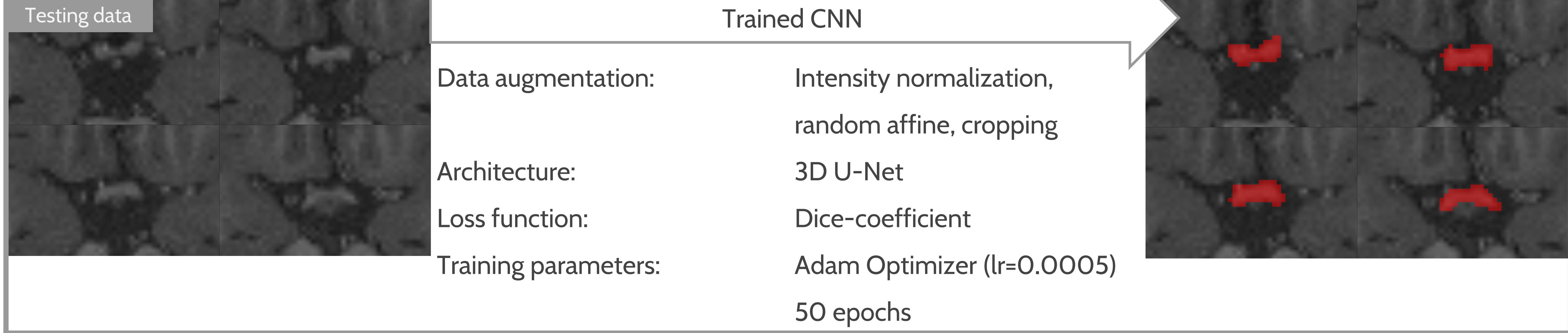
Otto-von-Guericke University (OVGU) data [albinism (n=9), achromatopsia (n=5) and controls (n=8] with hand-drawn chiasm masks

HCP Project control data (n=1065): network training (n=905), training validation (n=100) and training test (n=50)

Generation of optic chiasm target masks for HCP dataset

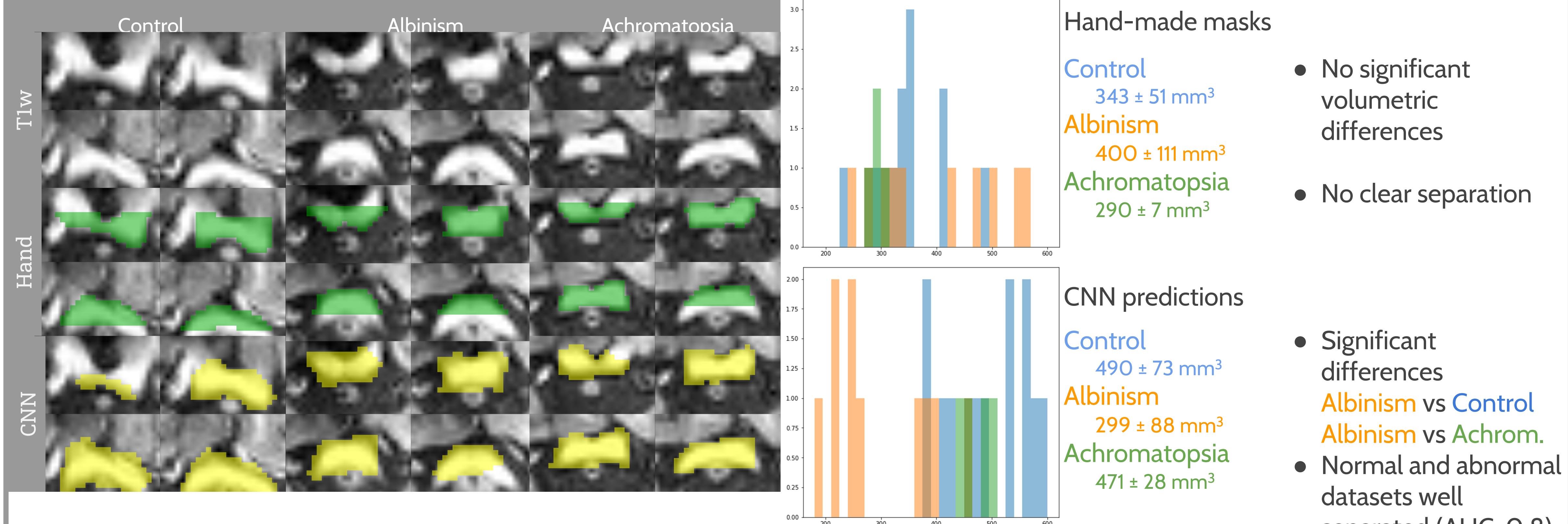


Convolutional Neural Network (CNN)



Results

CNN prediction using OVGU data



Conclusions

- Abnormal chiasmal crossing is followed by an abnormal structural pattern
- CNNs are sensitive to this altered pattern
- Proof of concept for CNN-based malformation detection
- Possible diagnostics with T1w MRI and CNNs

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References

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- Schmitz, B., Schaefer, T., Krick, C. M., Reith, W., Backens, M., & Käsmann-Kellner, B. (2003). Configuration of the optic chiasm in humans with albinism as revealed by magnetic resonance imaging. *Investigative ophthalmology & visual science*