

A Unified Artificial Intelligence Framework for 3D Biomodel Generation from Fetal MRI

EP15.24

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🎯 Objective

To evaluate whether an integrated artificial intelligence (AI) pipeline simplifies the generation of 3D biomodels from fetal magnetic resonance imaging (MRI) by comparing its performance with manual segmentation.

📊 Methods

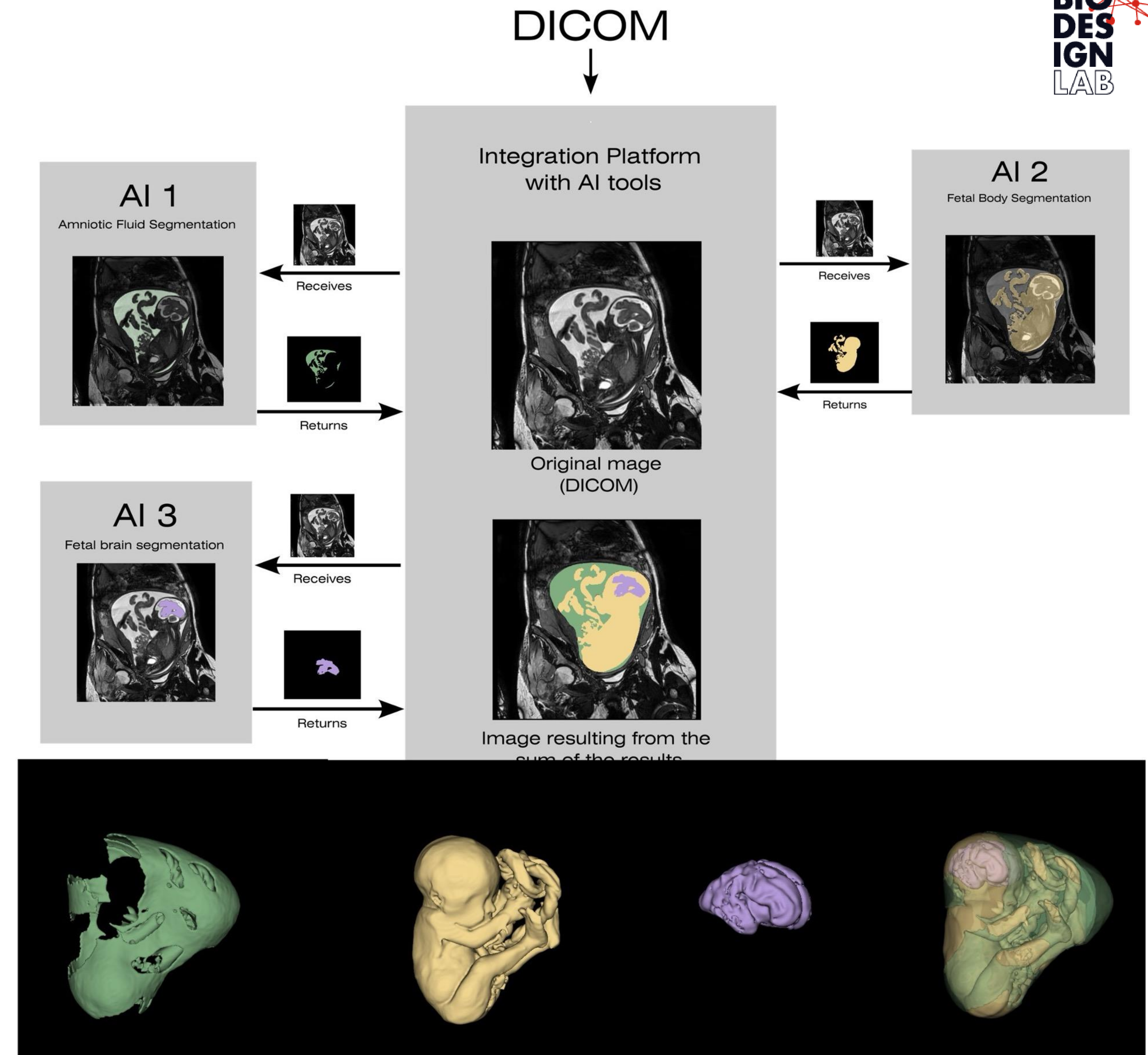
A total of 50 cases with different pathologies were evaluated. A comparative study was conducted using three segmentation approaches: manual segmentation (gold standard), fully automated segmentation using the proposed AI pipeline (pure AI), and a hybrid method combining AI output with manual refinement. Processing time and segmentation accuracy, measured by the Dice similarity coefficient, were analyzed.

📈 Results

The automated pipeline markedly reduced processing time, from 88.3 minutes with manual segmentation to 3.7 minutes using the pure AI approach, while achieving a Dice coefficient of 0.928. The hybrid method further improved accuracy, reaching a Dice coefficient of 0.942.

🔒 Conclusion

Integrating specialized AI models into a unified automated workflow is an effective strategy to overcome tool fragmentation. By substantially simplifying biomodel generation, this approach lowers technical barriers and facilitates the routine use of immersive technologies and 3D printing in fetal medicine.



AI models into a unified automated workflow