VRIJE UNIVERSITEIT BRUSSEL

The faculty of Engineering of the Vrije Universiteit Brussel invites you to attend the public defense leading to the degree of

DOCTOR OF ENGINEERING SCIENCES

of **Ran Zhao**

The public defense will take place on **Monday 6th October 2025 at 4 pm** in room **D.2.01** (Building D, VUB Main Campus)

To join the digital defense, please click here

DEEP LEARNING-BASED HUMAN POSTURE NORMALIZATION AND AUTOMATIC ANTHROPOMETRIC MEASUREMENT

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Abstract of the PhD research

Accurate body measurement is important for healthcare, ergonomics, fashion, and sports. Traditional contact-based methods are slow and inconvenient, while 3D scanning technologies, though contactless, remain limited: high-precision scanners are costly and impractical for everyday use, and affordable depth sensors often produce incomplete data with noise and missing points. In addition, all existing measurement methods require tight clothing and standardized poses to show clear and true body contours. These constraints prevent a user-friendly measurement.

This thesis develops a set of deep-learning methods to overcome these barriers and move toward human-centered, contactless measurement. OrienNormNet automatically aligns scans to a consistent orientation, enabling fully automated preprocessing. PoseNormNet transforms scans into a standard T-pose (people stands straight with arms stretched out like the letter 'T') while preserving individual identity details, eliminating the need for standard posture during measurement. W2H-Net predicts key health indicator: the waist-to-hip ratio directly from a single, clothed, partial scan in any posture. Finally, the MeasureXpert extracts comprehensive measurements from just two unregistered, clothed partial scans (front and back), jointly reconstructing body shape and posture.

Together, these contributions demonstrate that accurate, low-cost, and user-friendly anthropometric measurement is achievable, opening the door to practical applications in healthcare, personalized clothing, sports, and beyond.

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