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Towards Real-time Ergonomics Feedback and Educational Content with the use of Co-Robots.

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Work-related Musculoskeletal Disorders (WMSDs) are a prevalent concern in today's work environments

31% of all 2015 injury and illness cases were **WMSDs.**

12 days
Median days away from work

>34 million
Man-hours lost

[Bureau of Labor Statistics, 2015]

Work-related Musculoskeletal Disorders (WMSDs) are a prevalent concern in today's work environments

These statistics indicate that there still exist numerous opportunities to improve the ergonomic design of the current workplace

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Median days away from work

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Man-hours lost

[Bureau of Labor Statistics, 2015]

Engineering students will play a major role in the process of designing and improving work environments

- Designing new tools
- Improving workplace design
- Improving workplace safety
- Designing new processes

[*http://www.ime.psu.edu/research/index.aspx]

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Human Factors & Ergonomics (HF&E): *optimize human well-being and overall system performance*[+].

[*http://www.ime.psu.edu/research/index.aspx]

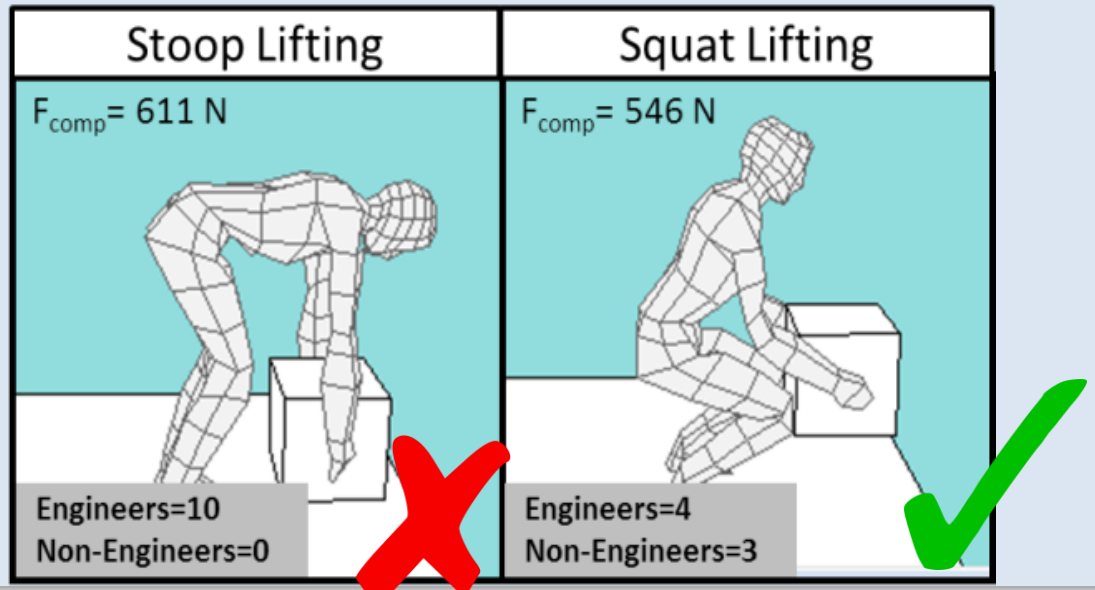
[+http://www.iea.cc/]

Human Factors and Ergonomics (HF&E) methods are not widely known among engineering students

Naeini and Mosaddad, 2013 : **71%** of students surveyed did not have a "*fair*" understanding of ergonomics and its significance for their future careers.

This work: **72%** of participants reported a 7 or less (on 10-point scale) when asked if they were familiar with the term "*musculoskeletal disorders*". **77%** if we excluded the non-engineering students

59%



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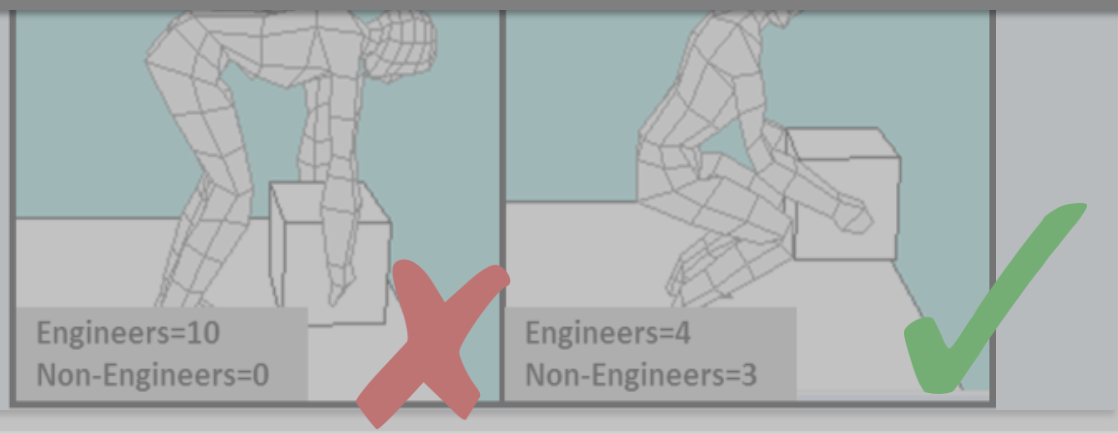
There is a need to advance HF&E knowledge and understanding among Engineering students.



Activities that promote Active Learning of HF&E need to be encouraged

- Satisfaction
- Motivation
- Learning

[Bures M, 2015]

[Eroglu *et al.*, 2013]

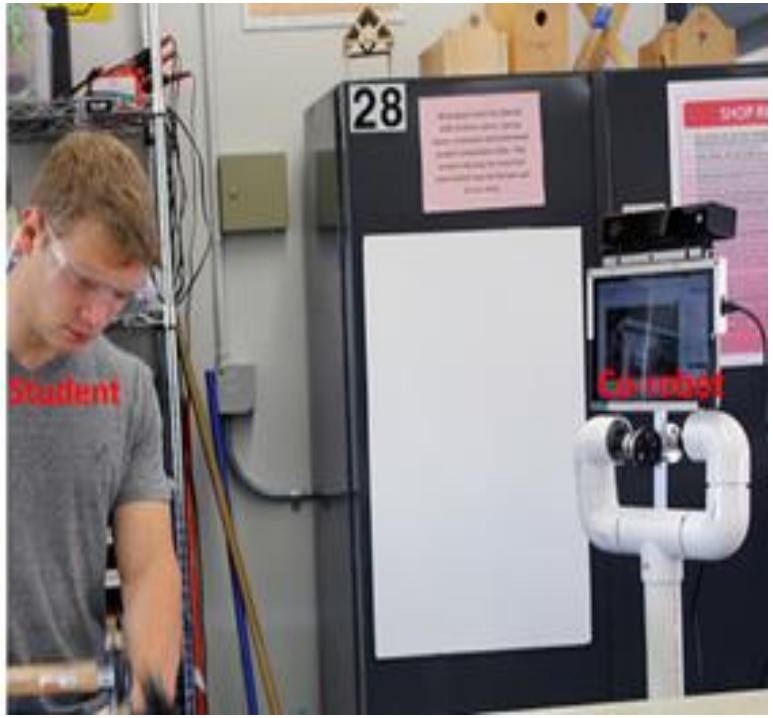
[Rios *et al.*, 2010]

[Agruss *et al.*, 2004]

[*http://sedtapp.psu.edu/]

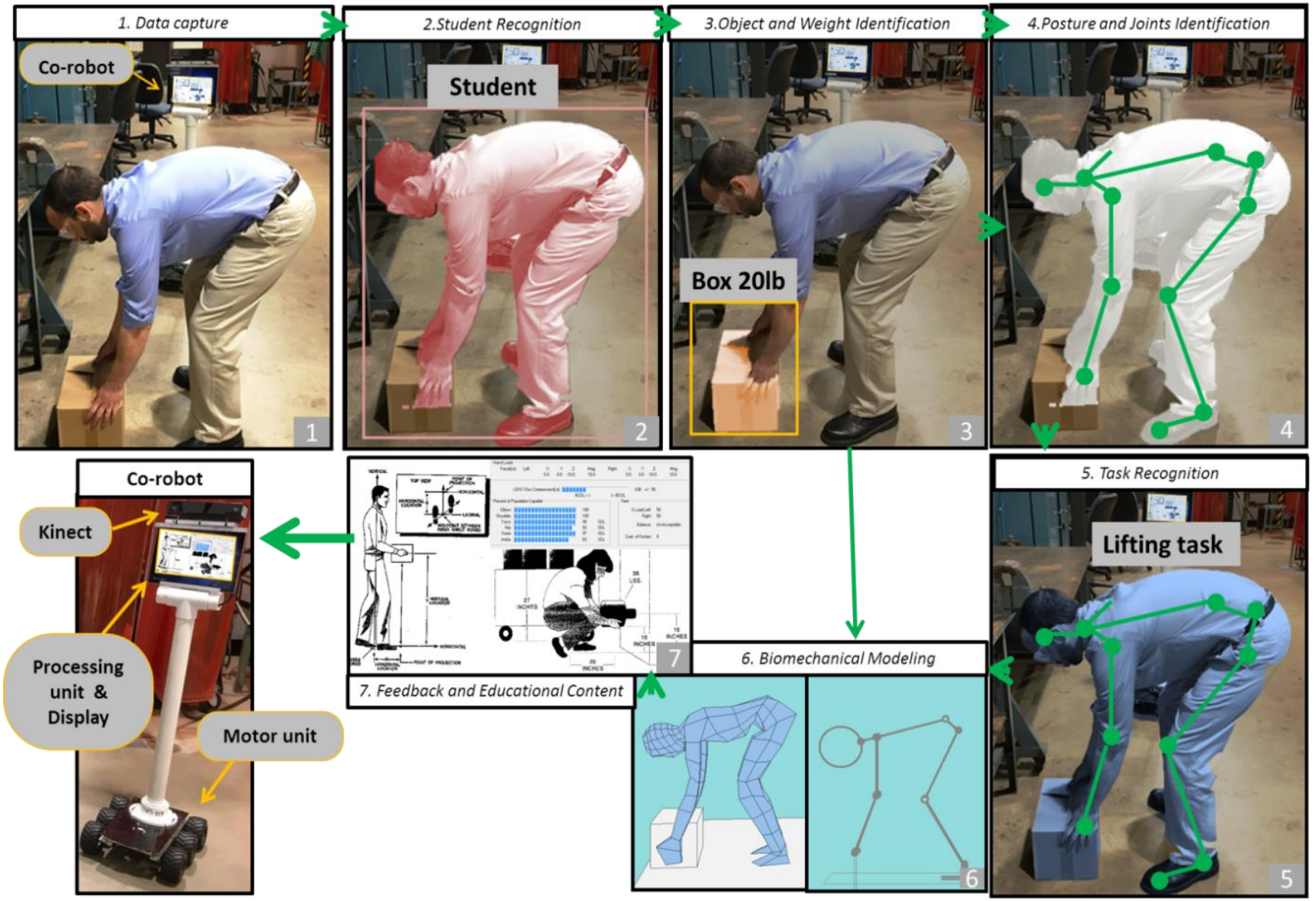
Researchers are starting to implement intelligent system technology (e.g., Robots) in educational settings [Mubin *et al*., 2013]

*Collaborative Robots (**Co-Robots**): are a class of robots that work in collaboration with humans towards the successful completion of a task.*

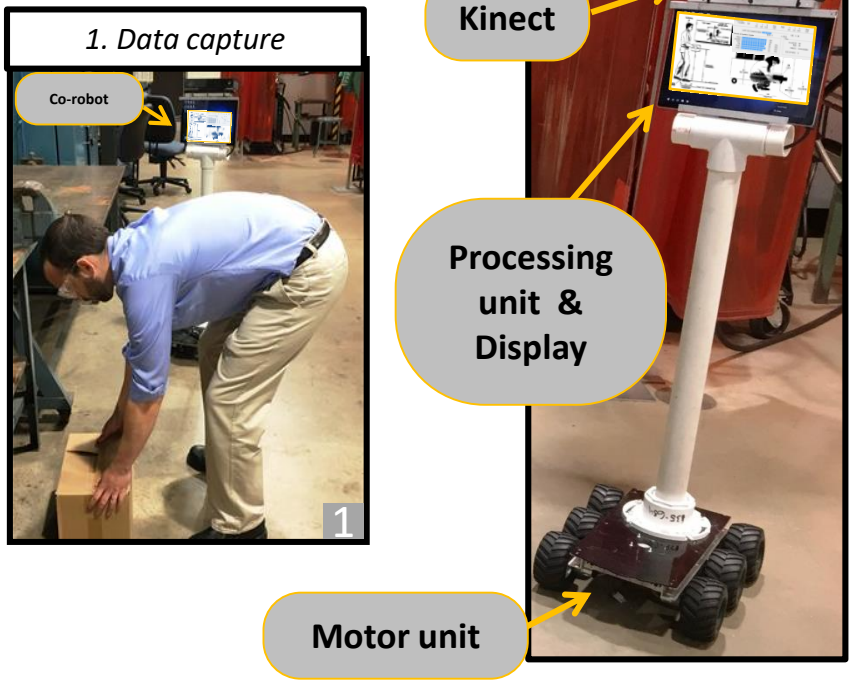


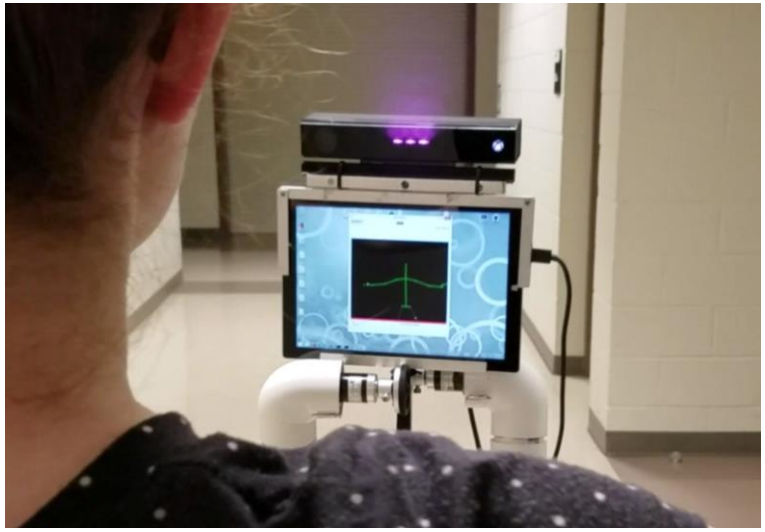
[Lopez & Tucker, 2017]

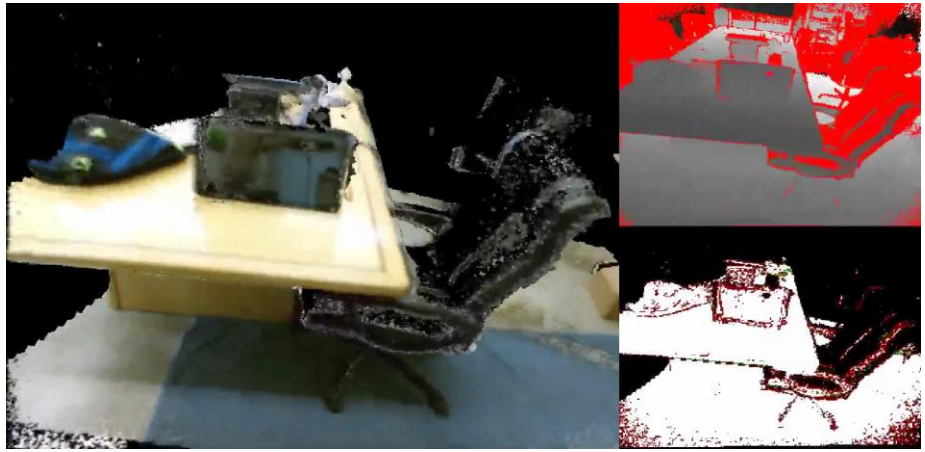
Co-Robots could provide real-time ergonomic feedback and HF&E educational content to students



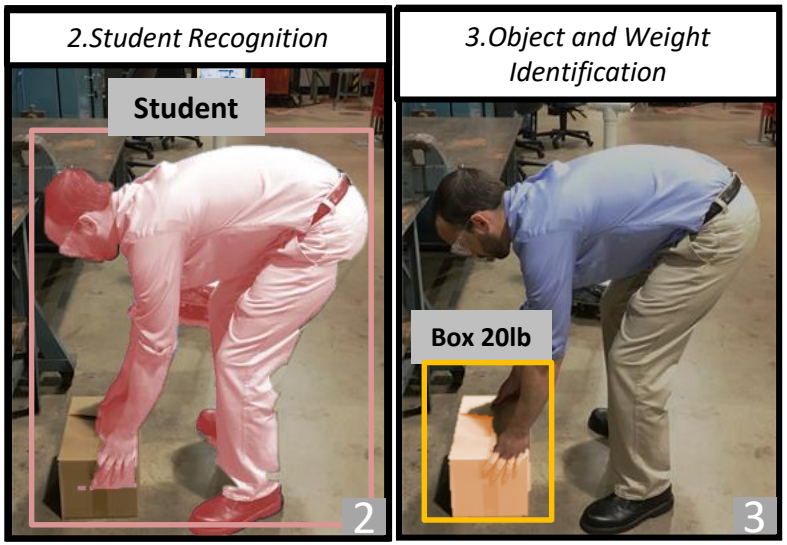
HF&E researchers have started exploring the use of low-cost RGB-D sensors to capture posture data [Plantard *et al.*, 2014]



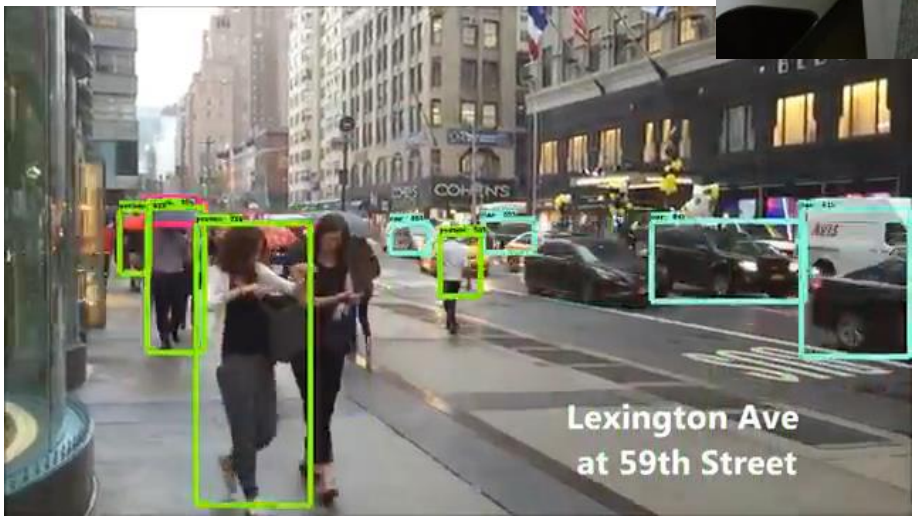




There has been significant advancement in Computer Vision and Object Recognition

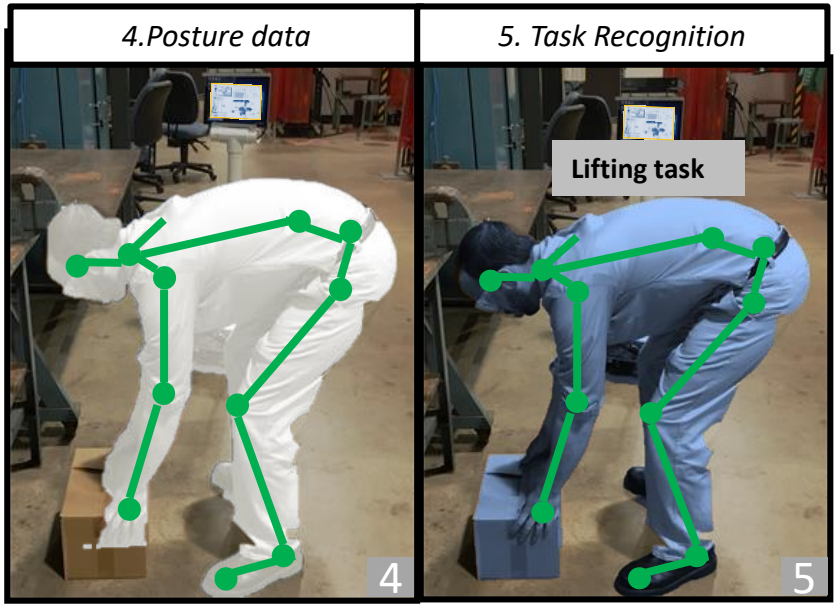


[Dering and Tucker, 2017]



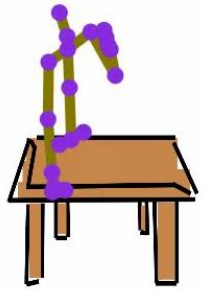
[Google, 2017]

There has been significant advancement in Machine Learning Applications

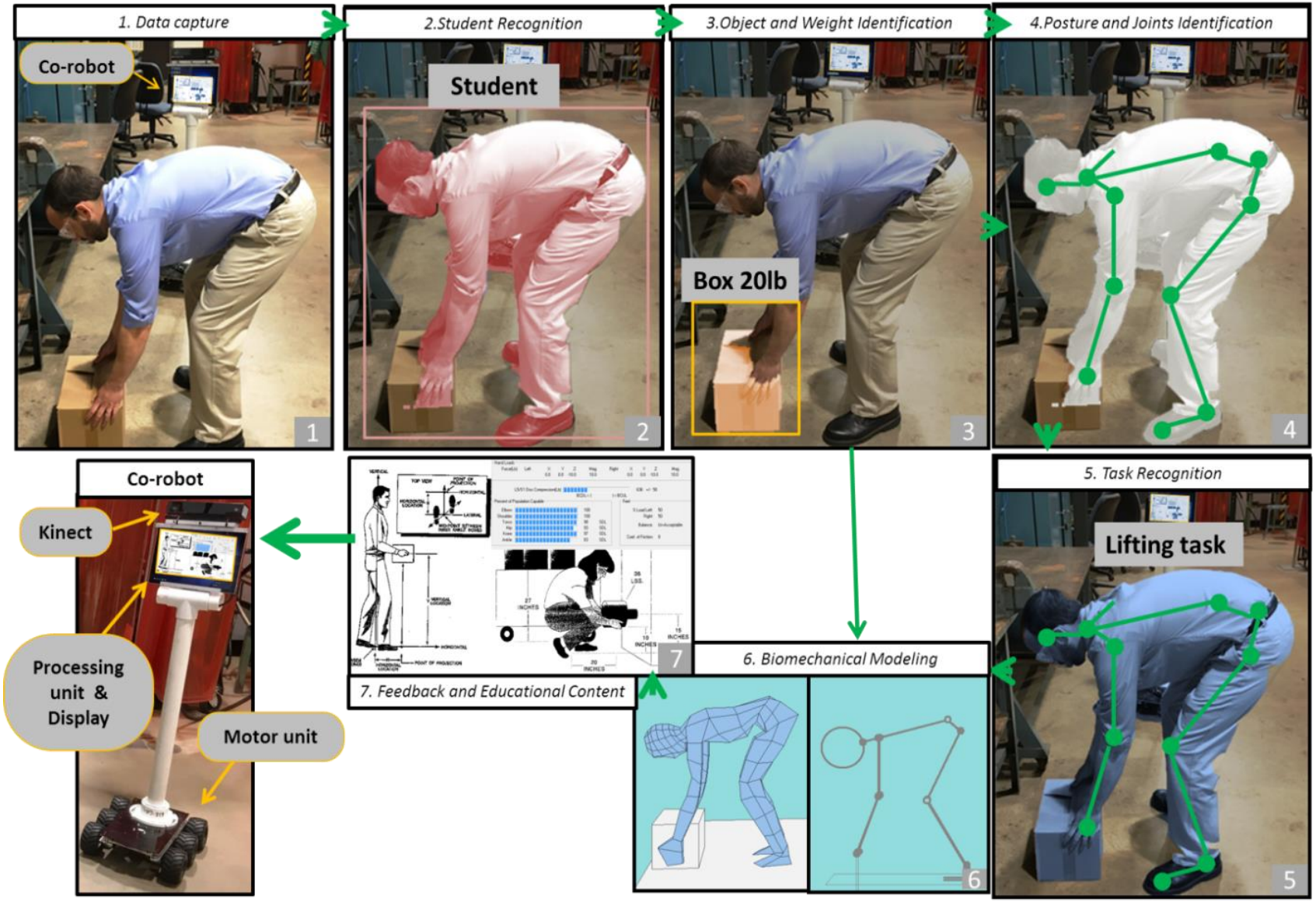


[Cao *et al.*, 2016]

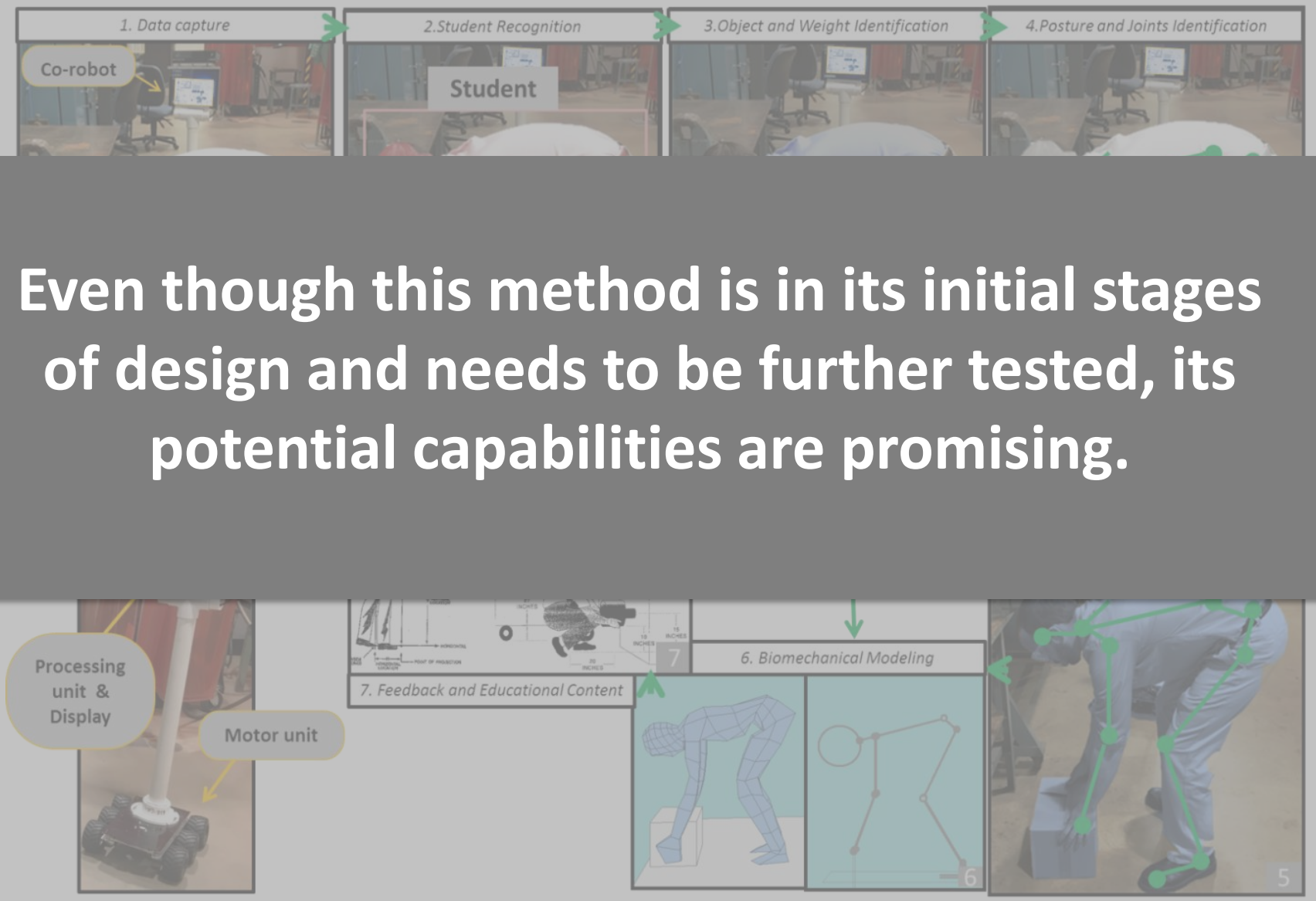
[Dering and Tucker, 2017]



These technologies could be integrated into a Co-robot system to provide HF&E educational content



All this data could be used to provide real-time ergonomic feedback and HF&E educational content



Even though this method is in its initial stages of design and needs to be further tested, its potential capabilities are promising.

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Thank you!

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