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EE180D CHALLENGE LEVELS: MOTION CLASSIFICATION FOR ACTIVITY PROFILING  
AND ENERGY EXPENDITURE ESTIMATION WITH PROFILE VISUALIZATION

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- 1) Objective
  - a. Classify activity profile for support of user activity management, clinical trial usage, and human energy expenditure where computation of energy will rely on the standard Metabolic Equivalent (MET) [1,2] conversion between activity segments and energy.
- 2) Subject Model
  - a. Well Individual - Residential, Workplace, Retail, and Healthcare Environment Model
- 3) Level 1:
  - a. Determine instances and periods of walking and walking speed classification
  - b. Competition scoring metrics
    - i. Fraction of time with correct classification for behavior at two different speeds as well as stationary state. Each behavior episode will be of length 1 to 2 minutes.
  - c. Expect at end of 3<sup>rd</sup> Week
- 4) Level 2:
  - a. Determine instances and periods of Single Step stair ascent and descent with speed classification
  - b. Competition scoring
    - i. Fraction of time with correct classification for behavior at two different speeds as well as stationary state. Each behavior episode will be of length 15 seconds to 1 minute.
    - ii. Applied to stairs in Engineering IV and Boelter Hall
  - c. Expect at 5<sup>th</sup> Week for Midterm
- 5) Level 3:
  - a. Determine instances and periods of walking and walking speed classification with slope detection ascent and descent
  - b. Competition scoring
    - i. Fraction of time with correct classification for behavior at two different speeds as well as stationary state. Each behavior episode will be of length 15 seconds to 1 minute.
  - c. Expect at 6<sup>th</sup> Week
- 6) Level 4:
  - a. Multiple step stair ascent and descent with speed classification
  - b. Competition scoring
    - i. Based on Level 2 scoring with addition of single step and multiple step classification.
  - c. Expect at 7<sup>th</sup> Week
- 7) Level 5:
  - a. Complex motion systems associated with dwell by user, transition for sedentary to motion, and unstructured activity
  - b. Competition scoring

- i. Combines 5min periods of walking, standing, sitting, ascent and descent of slopes and stairs.
  - ii. Verification by video ground truth and measurement of time correct classification
- c. Expect at 9<sup>th</sup> Week
- 8) Level 6: (Optional Extra Levels)
  - a. Optional Competition levels may include these examples:
    - i. Levels 1 – 6 implemented for subject model of afflicted individual
    - ii. Levels 1 – 6 implemented for subject model of individual using assistive device
    - iii. Other examples to be proposed by Groups. Please note that these optional levels do not take the place of Levels 1 through 6 so planning must proceed accordingly.
  - b. Expect at 10<sup>th</sup> Week

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#### REFERENCES

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[1] Compendium of Physical Activities Overview  
<http://prevention.sph.sc.edu/tools/compendium.htm>

[2] Compendium of Physical Activities  
[http://download.lww.com/wolterskluwer\\_vitalstream.com/PermaLink/MSS/A/MSS\\_43\\_8\\_2011\\_06\\_13\\_AINSWORTH\\_202093\\_SDC1.pdf](http://download.lww.com/wolterskluwer_vitalstream.com/PermaLink/MSS/A/MSS_43_8_2011_06_13_AINSWORTH_202093_SDC1.pdf)