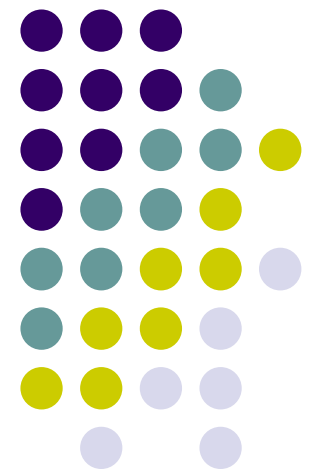


Ubiquitous and Mobile Computing
CS 528: Your Reactions Suggest You Liked
the Movie:
Automatic Content Rating via Reaction
Sensing

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Worcester Polytechnic Institute
(WPI)



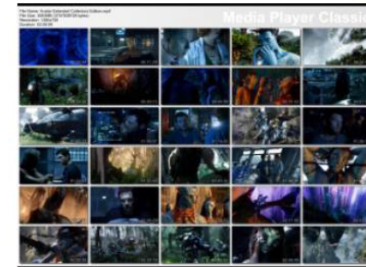
We Have & We Want



- Numbers?
- Stars?
- Percentages?
- Lossy
- Time-consuming

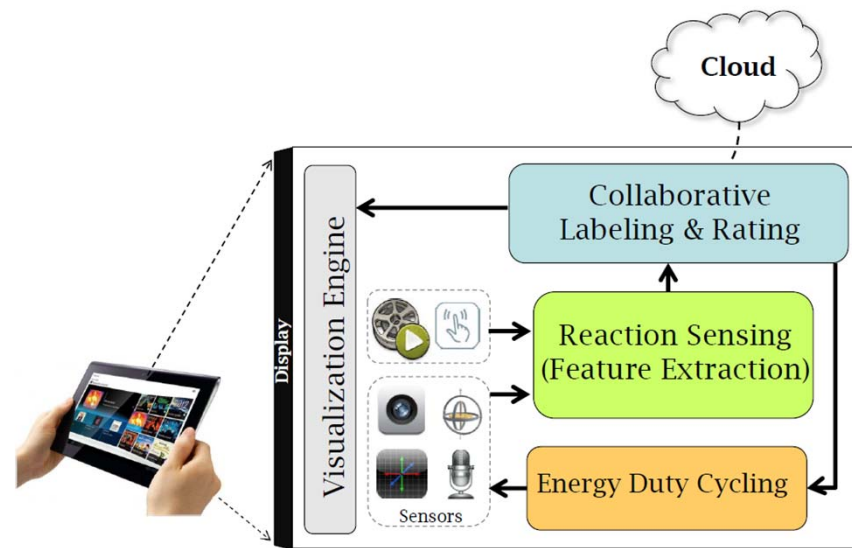


★★★★☆
Breathtaking
Sci-Fi Boring **Funny**
Smile Warm **Drama**
Exciting



Pulse system

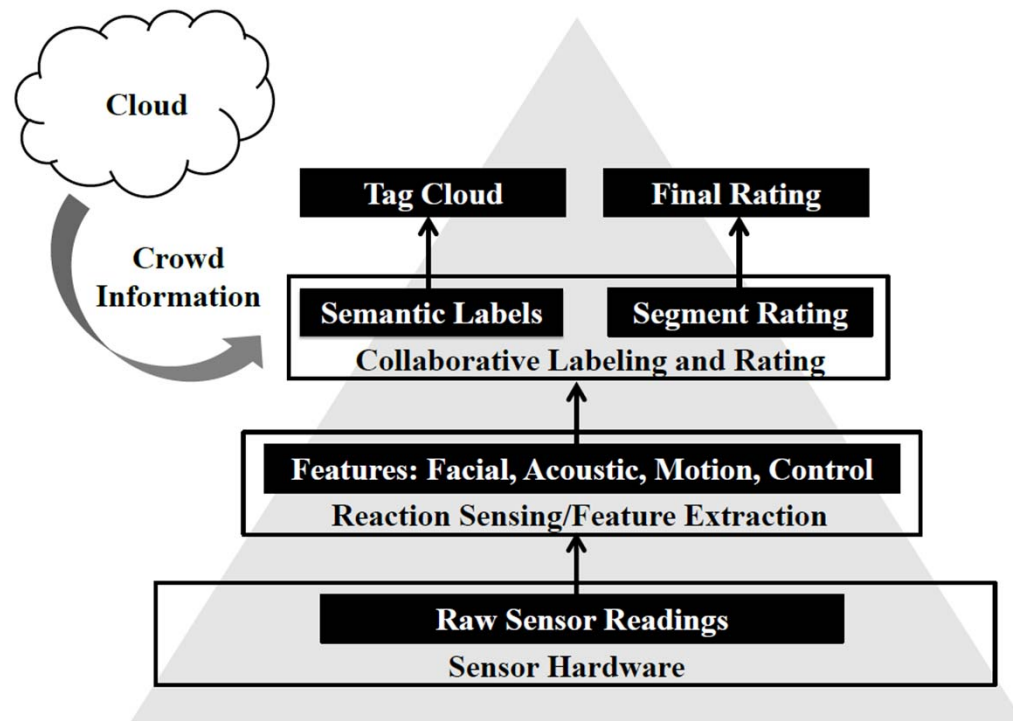
- Mobile platform
- Based on Android
- Using sensors
- Sensed reactions -> ratings



Reaction Sensing / Feature Extraction



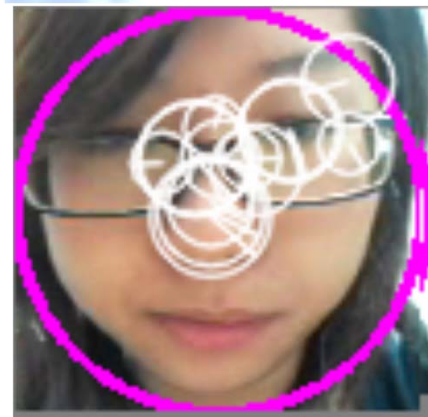
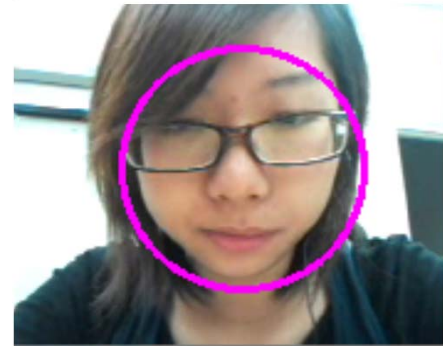
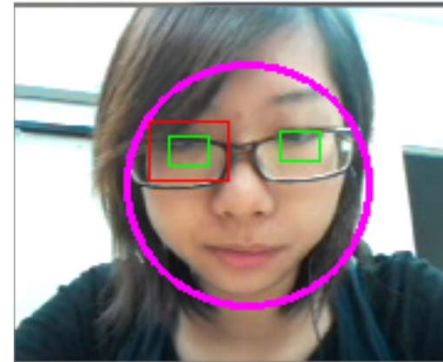
- Visual
 - Face
 - Eye
 - Blink
- Acoustic
 - Voice
 - Laughter
- Motion
- Touch





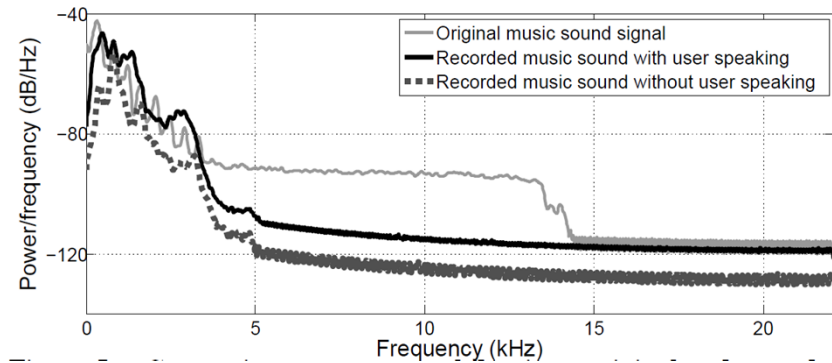
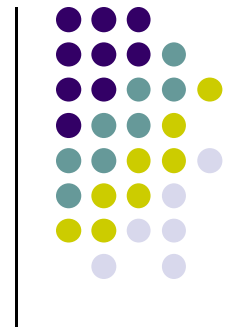
Visual

- Continuous contour matching
- Eyes and key points
- Blink-detection & eye tracking
 - Changed pixels in consecutive frames
 - Useful for users with spectacles
- Features:
 - Face, eyes, lip, etc.
 - Position, size, etc.



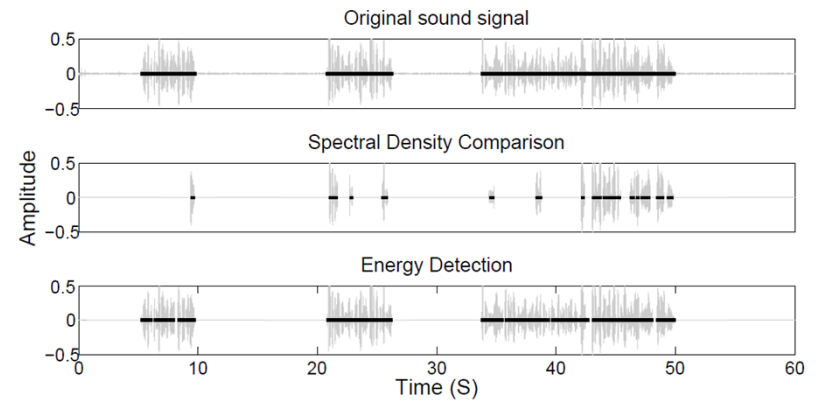
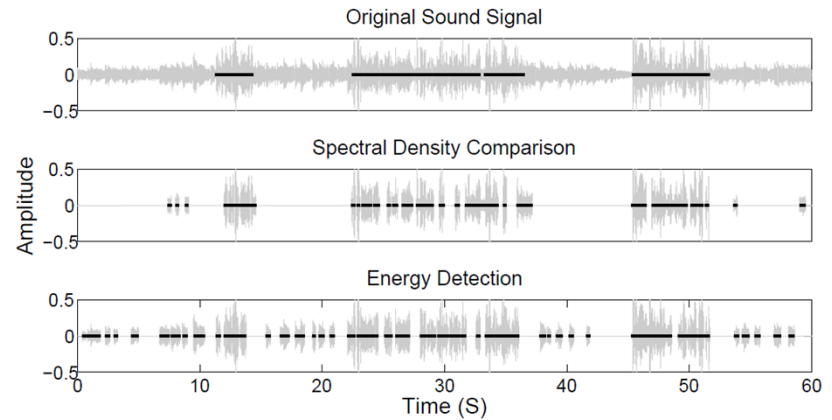
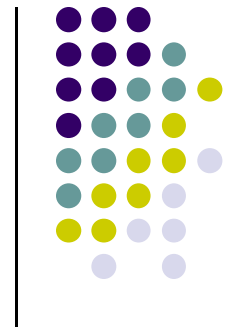
Acoustic

- Activates microphone
- Records ambient sounds
- Separate users' voice



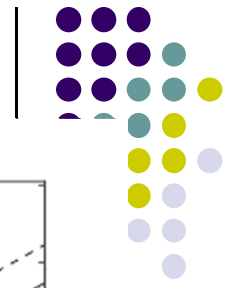
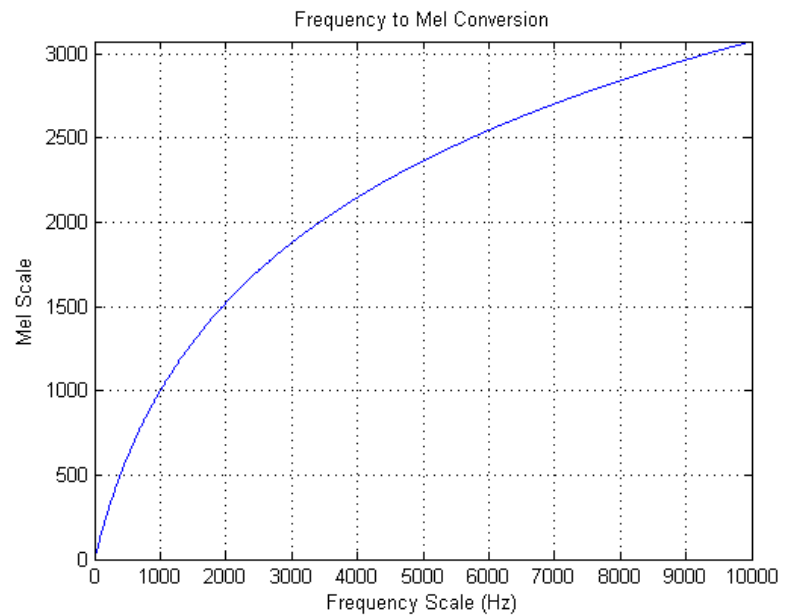
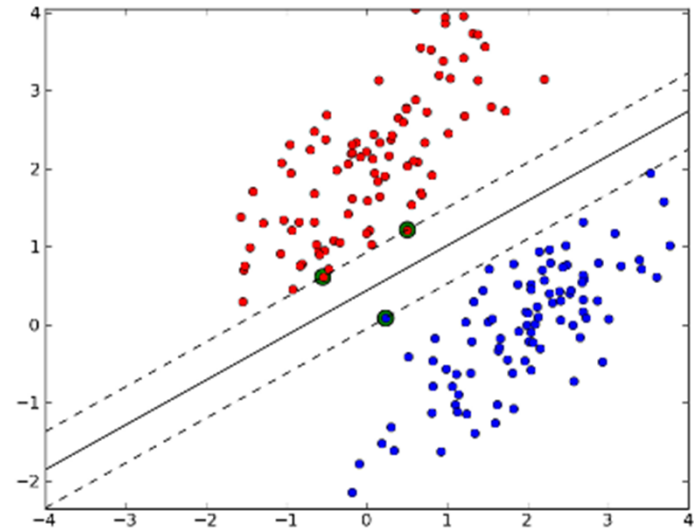
Acoustic: Voice

- 2 heuristic methods
 - Energy detection w/ speech enhancement
 - Noise suppression
 - Low ambient volume
 - Per-frame spectral density
 - Per-frequency amplitude
 - High ambient volume



Acoustic: Laughter

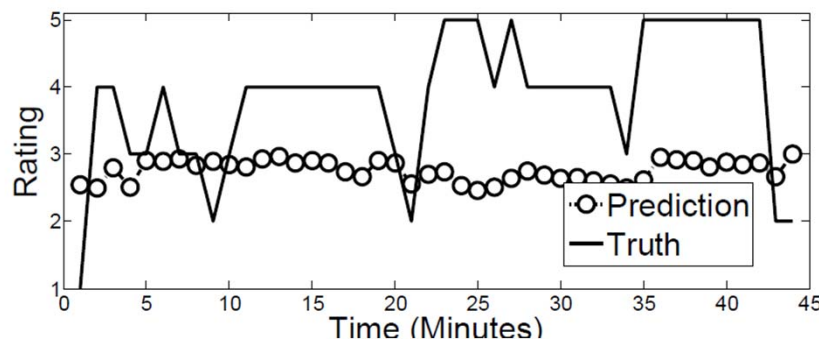
- Support vector machine (SVM)
- Mel-Frequency cepstral coefficients (MFCC)



Collaborative Labeling & Rating

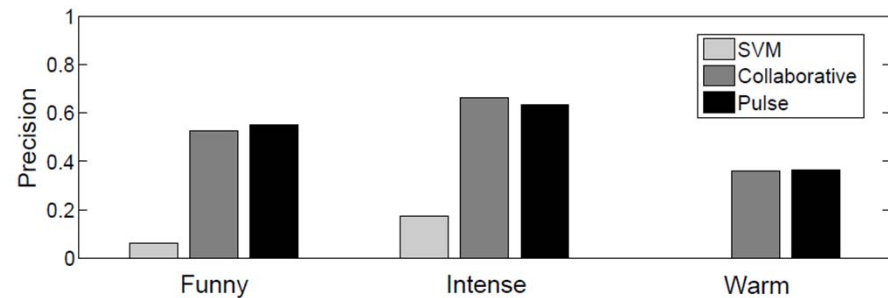
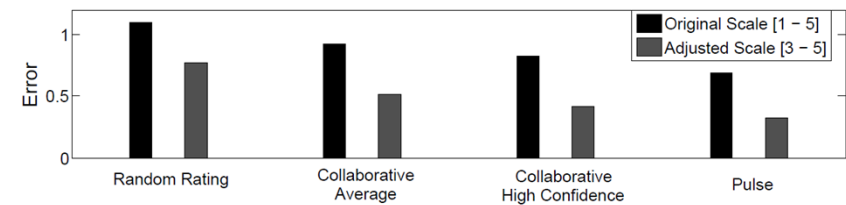
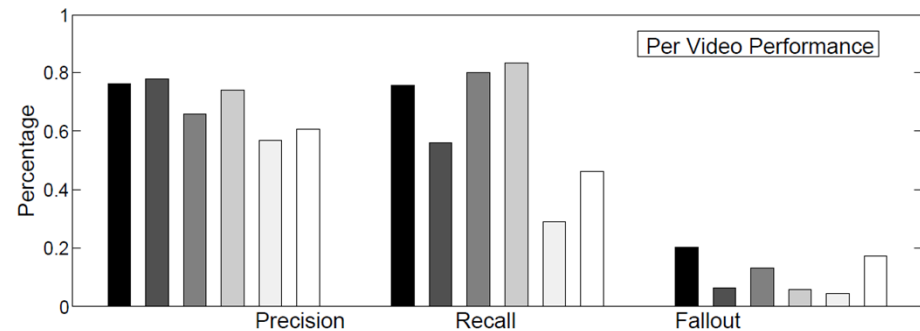
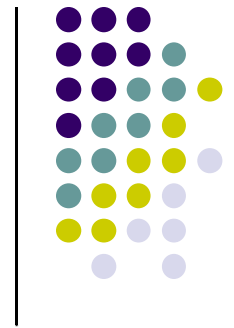


- Reaction labels
- Perception labels
- Combining Collaborative Filtering and SVM/GPR
- Accuracy and heterogeneity



Results

- Segment rating
 - Average error 0.7
 - 71% precision, 64% recall, 9% fallout
- Final rating: Average error 0.46
- Label quality: much better than pure SVM
- Power consumption: 16% more



Conclusions



- Advantages

- New aspects of rating
- High accuracy
- Holding variety

- Issues

- Sample capacity
- Over-fitting
- Privacy



References

- http://en.wikipedia.org/wiki/Collaborative_filtering
- http://en.wikipedia.org/wiki/Mel-frequency_cepstrum

Thank you

