



Initial Experience With AI-based Video Monitoring for Delirium-Associated Factors and Room Environment

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Disclosure: Michael A. Choma, MD, PhD

In the 24-months prior to this presentation, I declare the following ineligible company financial relationships:

- I am an employee of LookDeep Health with compensation that includes stock options; I also hold stock in LookDeep Health.
- I also am an advisor for Myrrym and receive stock as compensation.

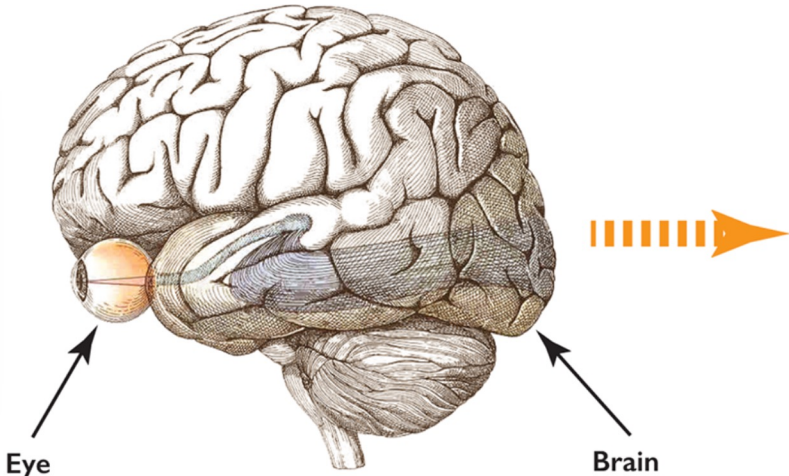




Introduction

- Symptoms of delirium characteristically fluctuate, yet patient assessments are intermittent.
- Current limitation in ways to continuously monitor room environment
 - AI-based computer vision as a solution to continuous monitoring of environment
- We present our initial experience with an AI-based video method for continuous monitoring of patient activity and room environment for patients at high-risk for developing delirium

Human Vision



bowl, oranges,
bananas, lemons,
peaches

(sensing device responsible for capturing images of the environment)

(interpreting device responsible for understanding the image content)

Expert
Intermittent / Serial
Qualitative

AI Computer Vision



Input

Sensing device

Interpreting device

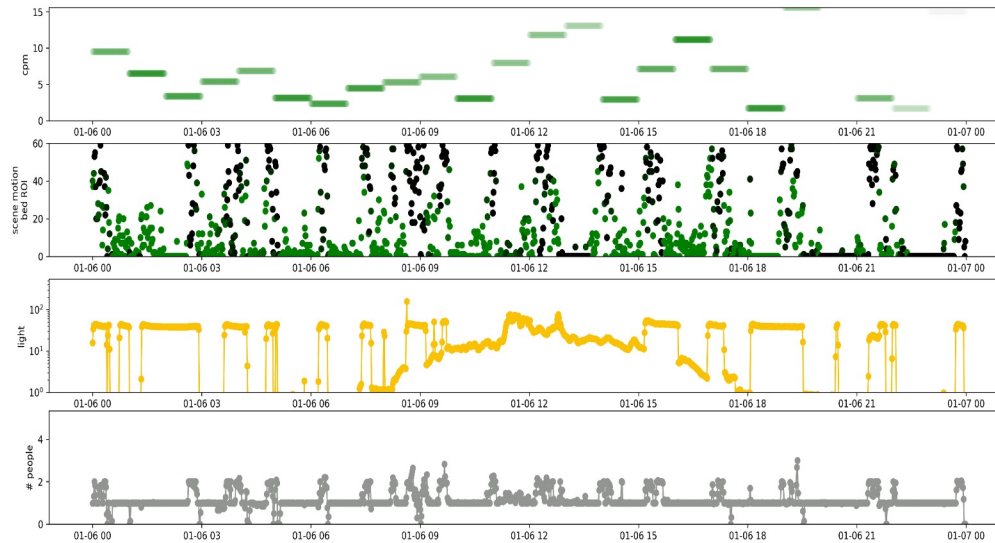
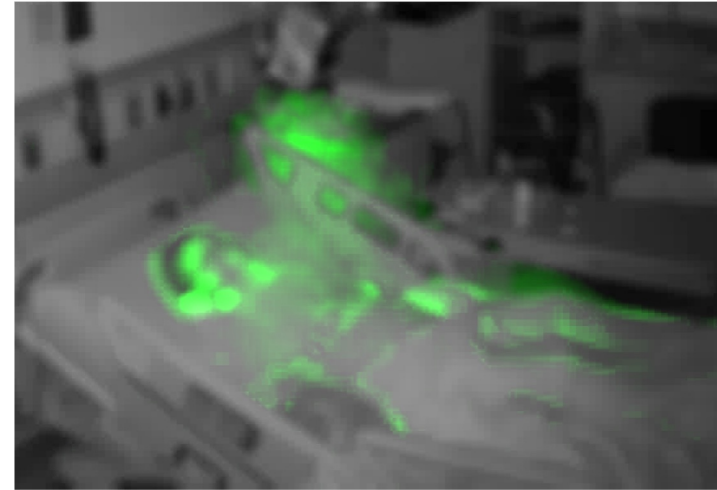
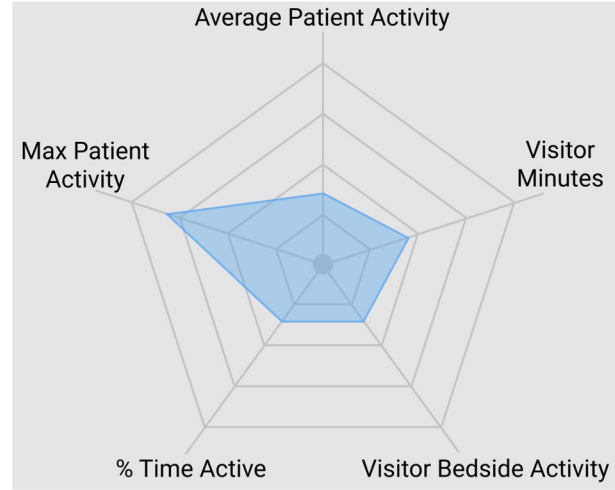
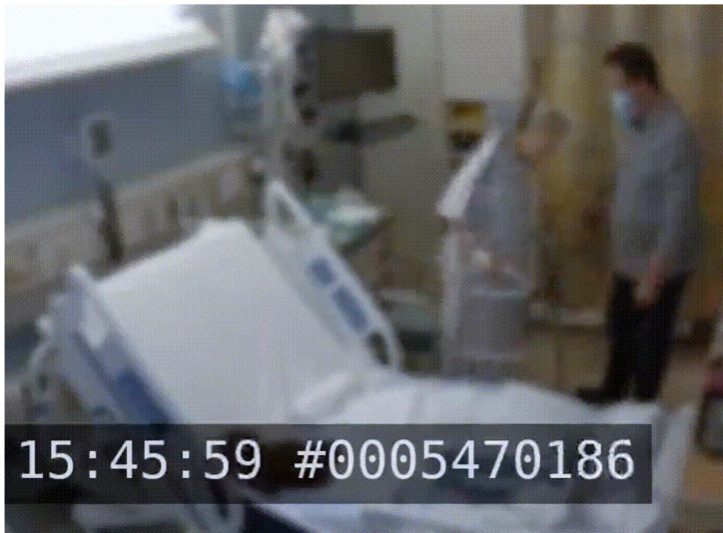
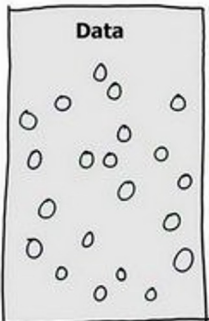
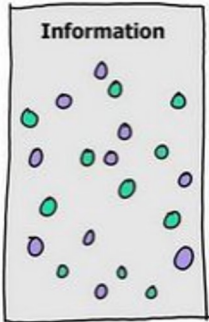
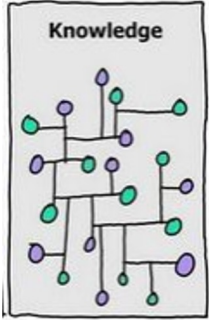
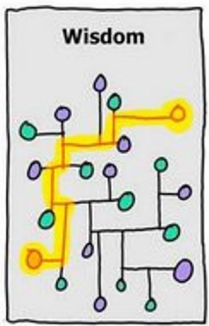
Output

bowl, oranges,
bananas, lemons,
peaches

Not yet expert
Always-on / Parallel
Quantitative

Figure: Deep Learning for Vision Systems

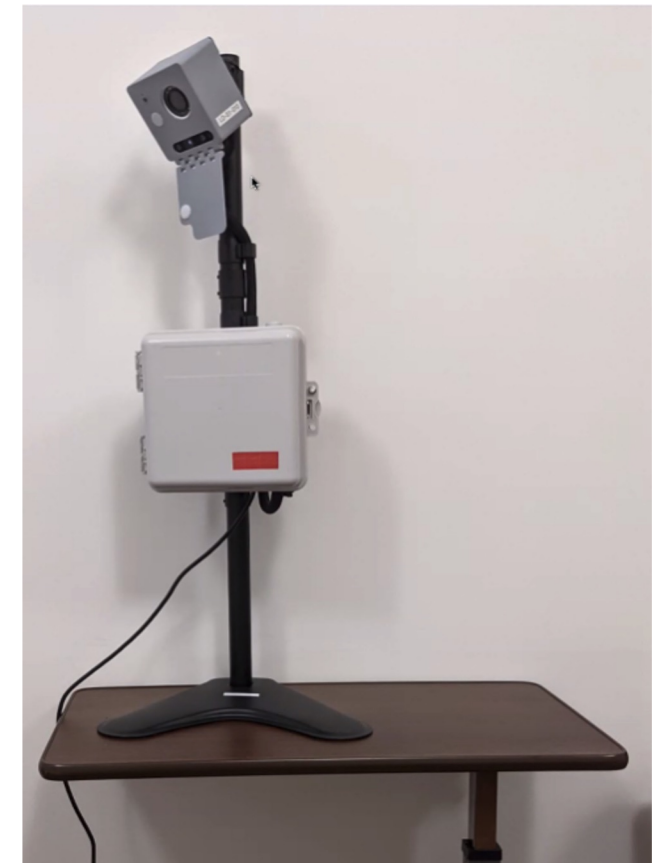
Utility in clinical decision-making





Study Design

- Patients aged 65-90 admitted to OHSU after a trauma activation
 - High risk for delirium without prior diagnosis of delirium, major neurocognitive disorder, or major affective/psychotic disorders.
 - Utilized video cart with color and night vision cameras.
 - Video data were continuously streamed to an encrypted hard drive for up to 7 days. Quantifying patient and bedside activity, and number of people in the room.
 - Data streams were used to generate visual and graphical overnight reports.





Case Report

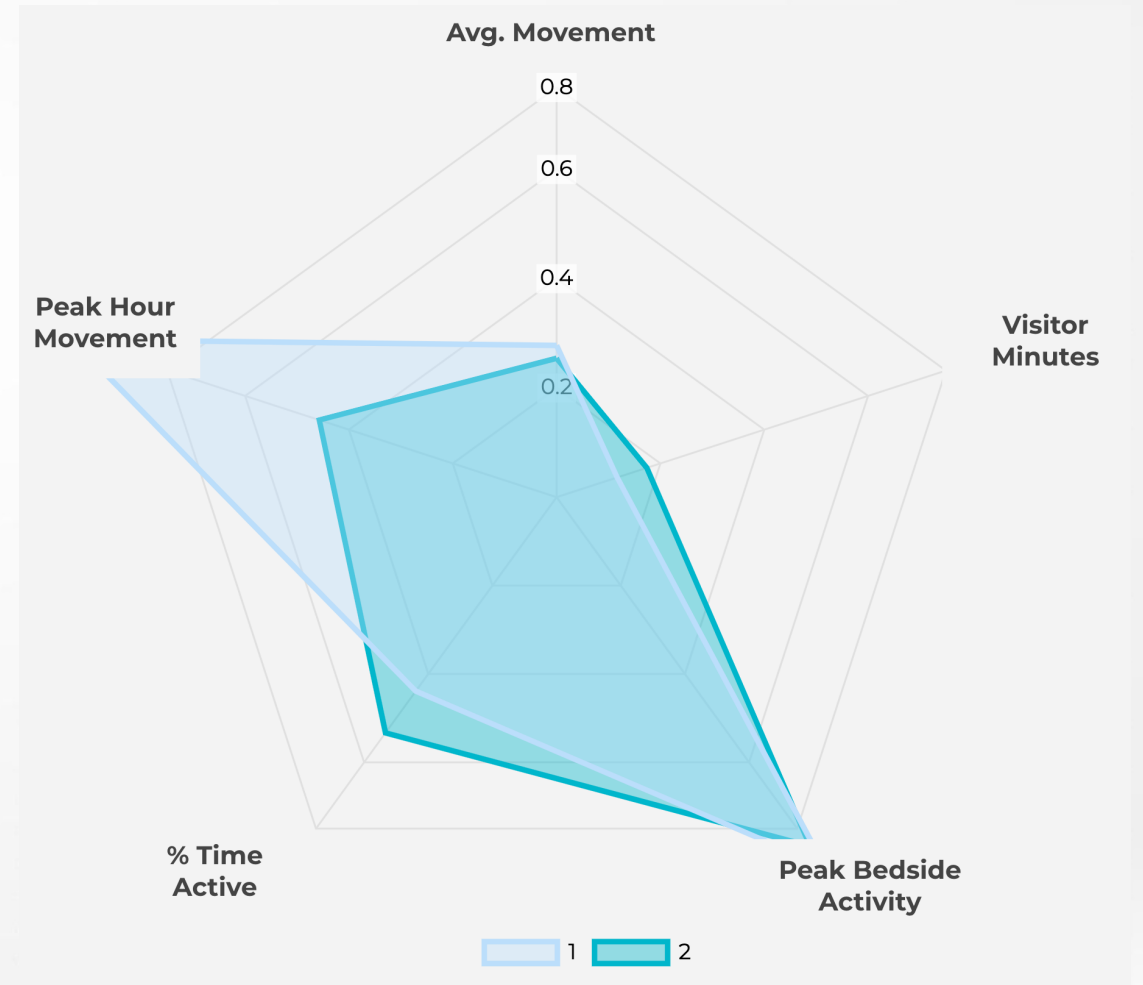
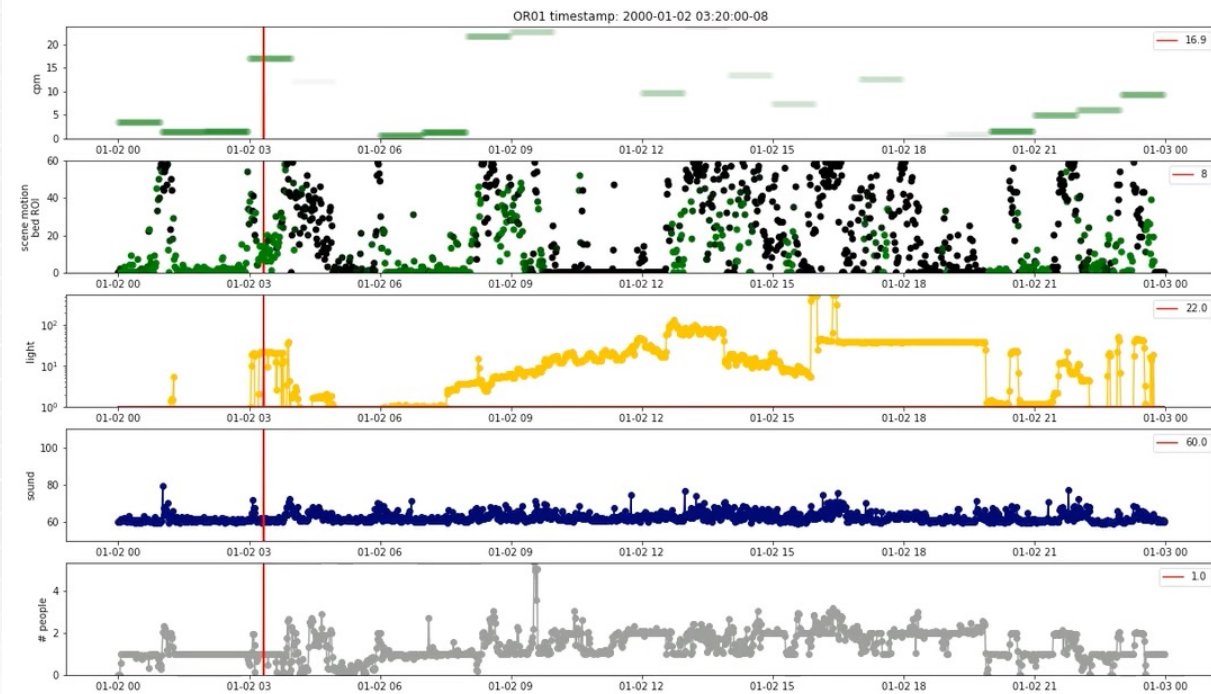
- An 80-year-old female was admitted after a motor vehicle collision with rib, spinal, and hip fractures. No head trauma was noted. She remained on the trauma service for non-operative management of these fractures. Recording started on day 2 of admission.



Case Report

- AI-assisted video actigraphic analysis
 - Rest-wake inversion on video summaries generated of the nighttime period as well as by motion “heat maps” that visually display patient activity over a given time interval.
 - Significant bedside activity through the daytime and nighttime on most days, consistent with frequent staff visits seen on video summaries.
 - Information was presented via a visual overnight report, with summary images, heatmaps, and video of the busiest 5-minutes in each hour, enabling rapid review of the overnight period.

Overnight report





2000-01-01T21:34:00.000-08:00



2000-01-01T22:26:00.000-08:00



2000-01-01T23:00:00.000-08:00



2000-01-02T00:54:00.000-08:00



2000-01-02T01:04:00.000-08:00



2000-01-02T02:54:00.000-08:00



2000-01-02T03:49:00.000-08:00



2000-01-02T04:04:00.000-08:00



2000-01-02T05:54:00.000-08:00



Conclusion and Next Steps

- Potential in the care of patients at-risk for delirium.
 - AI-generated insight suggested manifestations of acute delirium that may have been misinterpreted as worsening overall cognition.
- Continuous monitoring may help shift from a dichotomous paradigm of delirious/not delirious to a paradigm that recognizes that it exists on a continuum.



References

- Kang J, Lee M, Ko H, et al. Effect of nonpharmacological interventions for the prevention of delirium in the intensive care unit: A systematic review and meta-analysis. *J Crit Care*. 2018;48:372-384. doi:10.1016/j.jcrc.2018.09.032