

The Fire Within: Team Heat Stroke

Wearable sensors for predicting heat stroke risk with machine learning techniques

Summary

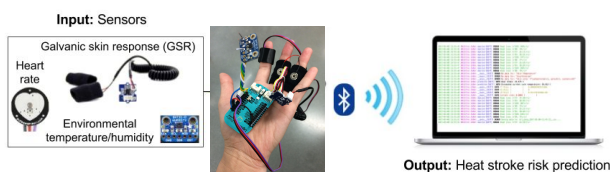
- Annually, thousands of people die from heat stroke in hot and resource-limited regions of the world like India
- We developed a device for predicting heat stroke in advance of onset to reduce heat stroke incidence
- The device uses a series of physiological and environmental sensors combined with machine learning
- Similar devices exist for monitoring other health conditions, but our machine learning algorithms are unique
- The device would be useful for people in heat waves and valuable to emergency responders in India
- Future work includes optimizing cost and predictive power while reducing the number of sensors used

Problem, Need Statement and Need Criteria

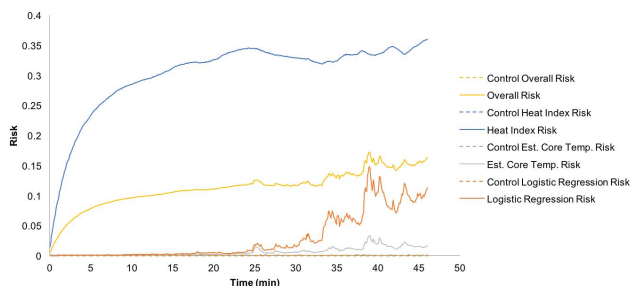
- The 2015 summer Indian heat wave resulted in thousands of deaths over a 2-month period
- People uneducated about and at risk for non-exertional heat stroke in hot regions of India need a method to reduce the likelihood of experiencing heat stroke to decrease mortality
- Solution results in $< 0.0005\%$ probability of heat stroke during a heat wave in India
- Solution does not require extensive training
- Solution works in low to high humidity and medium to high temperatures
- Cost of solution should be under \$10

Solution

- We envision a wearable set of sensors that sends data to an algorithm that outputs the user's current risk of heat stroke. Communication with a mobile phone allows users to receive information about actions to take to prevent heat stroke.
- We intend for the system to be used by people in India during heat waves. It could be used for people to monitor themselves, or to monitor family members who may be at higher risk (e.g., the elderly, children).
- Experimental setup for testing feasibility:



- Plot of risk vs. time:



Competitive Landscape

- Others have developed systems of sensors for monitoring health, including one monitoring heat stress.
- However, none address heat stroke specifically and none use machine learning as part of a prediction algorithm.

Value

- Our device could be valuable to emergency responders in India. By having people take more preventative action, the number of hospitalizations for heat strokes would decrease.
- We anticipate the Indian government would pay for distributing our device.

Future Milestones

- Determine relative importance of each sensor and parameter by examining logistic regression weights and calculating correlations between sensor data and risk estimates
- Optimize device cost
- Test predictive power of test on populations in India

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