Wellzion Placement and Temperature Traces in Stove-Use Monitoring

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Berkeley Air Monitoring Group
Sunday, 27 January 2019
Background

We monitor stove use based on changes in temperature to understand the use of various stoves and fires within the home, to model various impact scenarios, and to contextualize information gathered through other data collection methods.

Field team members are trained in the deployment and management of stove use monitors.
Background

Data comes back from the field in a .csv read out of temperature at preset sampling intervals, which we process using SUMSarizer.

Temperature traces are grouped by stove type, a subset is hand-labeled and SUMSarizer uses ML to generate labels for the remaining traces.

Outputs can be framed as number of events, duration of events, and total cooking time.
Blue points indicate those randomly selected as part of the training set.
#1: Standard radial distance from fire, above ash

#2: Standard radial distance from fire, under ash

#3: 10cm further than standard radial distance from fire, above ash

#4: 20cm further than standard radial distance from fire, above ash
Total Cooking Time

**CO_01DAGT**

<table>
<thead>
<tr>
<th>Distance</th>
<th>Total Cooking Time (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard (10cm)</td>
<td>600</td>
</tr>
<tr>
<td>Ash (10cm)</td>
<td>200</td>
</tr>
<tr>
<td>Far (20cm)</td>
<td>400</td>
</tr>
<tr>
<td>Farther (30cm)</td>
<td>1400</td>
</tr>
</tbody>
</table>

**CO_06FSBT**

<table>
<thead>
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<th>Distance</th>
<th>Total Cooking Time (minutes)</th>
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<tbody>
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</tr>
<tr>
<td>Ash (10cm)</td>
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<tr>
<td>Far (20cm)</td>
<td>400</td>
</tr>
<tr>
<td>Farther (30cm)</td>
<td>1400</td>
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**CO-08FSBT**

<table>
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<th>Total Cooking Time (minutes)</th>
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</thead>
<tbody>
<tr>
<td>Standard (10cm)</td>
<td>600</td>
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<tr>
<td>Ash (10cm)</td>
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<tr>
<td>Far (20cm)</td>
<td>3815</td>
</tr>
<tr>
<td>Farther (30cm)</td>
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</table>
Total Number of Events

**CO_01DAGT**

<table>
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<th>Events</th>
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<tr>
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<tr>
<td>Ash (10cm)</td>
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</tr>
<tr>
<td>Far (20cm)</td>
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<td>Farther (30cm)</td>
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**CO_06FSBT**

<table>
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<th>Distance</th>
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</thead>
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<td>Ash (10cm)</td>
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</tr>
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</tr>
<tr>
<td>Farther (30cm)</td>
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</tr>
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</table>

**CO_08FSBT**

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</tr>
<tr>
<td>Ash (10cm)</td>
<td>6</td>
</tr>
<tr>
<td>Far (20cm)</td>
<td>5</td>
</tr>
<tr>
<td>Farther (30cm)</td>
<td>10</td>
</tr>
</tbody>
</table>
Take-aways

- Sensor resolution and responsiveness can be evaluated and manipulated to better understand how cooking activities are reflected in temperature traces.

- Familiarity with our temperature traces allow us to sort our data so that analysis, manual and ML, is consistent.

- Familiarity also allows us to troubleshoot from afar.

- Standard placement looks good! Ash and distance introduce unpredictability.

- Data collection methods work best with the buddy-system.