Belief Revision in Picnic Planning

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Introduction

pic·nic

/ˈpikˌnik/

noun

1. an outing or occasion that involves taking a packed meal to be eaten **outdoors**.
   "we swam and went on picnics"

- We worked on a system that could tell if the weather was good enough for a picnic
- The system would base its belief on an initial observation, the weather forecast, and a second observation (and second forecast check if needed)
- There was also not much research on our specific problem on how people weigh the different weather properties(temperature,humidity, etc)
- So we had to survey the class to get a basis on how people weigh each part of the forecast

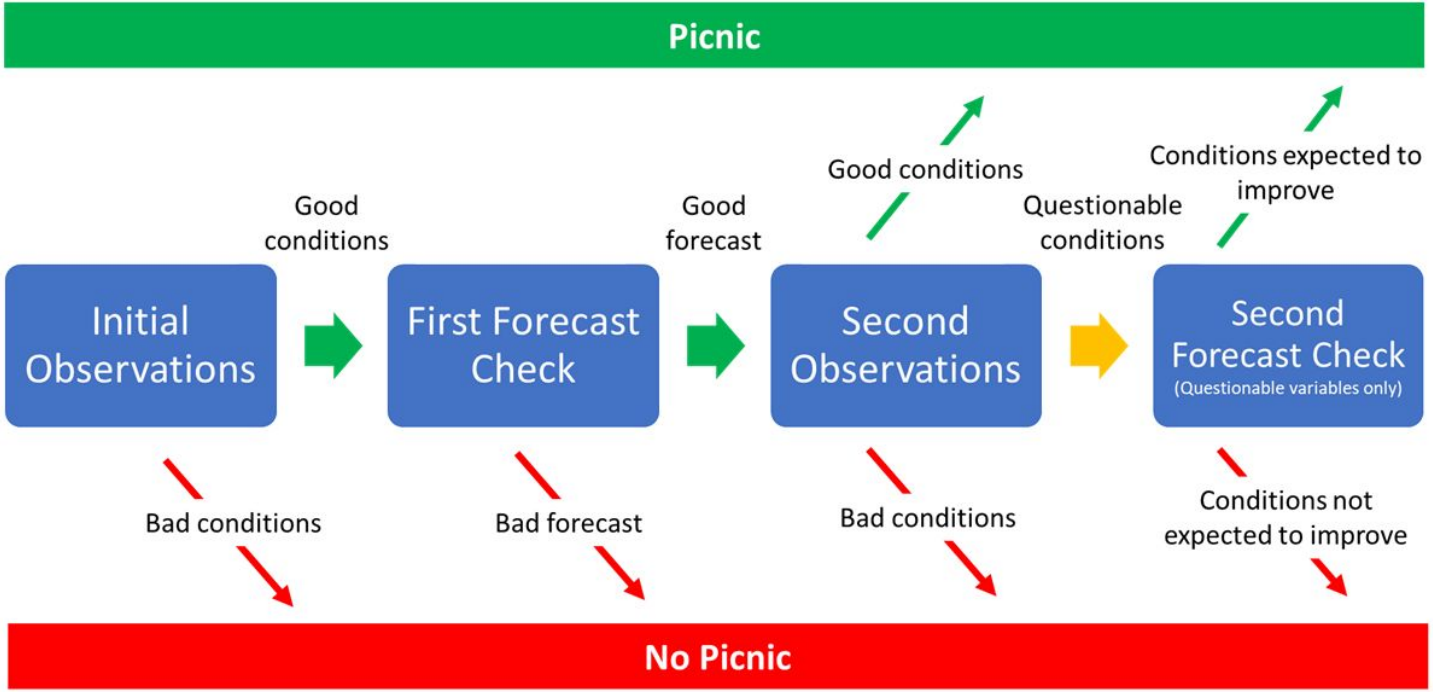
Background

- Isn’t a lot of specific research on weather-related belief revision process
  - Tried to use Eli and Kaitlyn’s meteorology backgrounds to help
- Vul et al. (2014) found that humans use revised probability of an event occurring after taking new information into account
  - Basis for the belief revision model we created
    - Checks weather observations, looks at several forecasts
    - Takes new information into account before in making decision about going on picnic

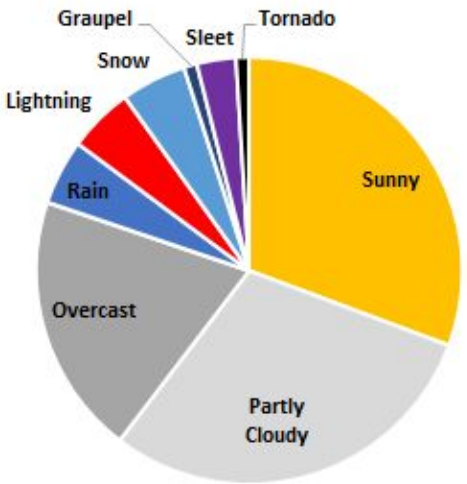
Approach

- A model was created to simulate belief revision leading up to a picnic that someone is planning
- Uses a combination of observations and a randomly generated forecasts to modify belief over a time period
- Will always result in either the person deciding that it is good to have a picnic or that is is not good to have a picnic

Implementation of Belief Revision



Forecast Condition Distribution



Condition	Chance [%]
Sunny	30
Partly Cloudy	30
Overcast	20
Rain	5
Lightning	5
Snow	5
Graupel	1
Sleet	3
Tornado	1

Forecast Belief Determination

- Each forecast is assigned a point depending on how unideal it is for a picnic
- Point is the sum of individual variable points
  - Temperature points are determined by half the positive difference from the ideal times the weight
  - Dewpoint points are determined by half the positive difference from the ideal times the weight if the forecast is greater than the ideal. 0 points are assigned if the forecast is less than the ideal
  - Wind points are determined by half the positive difference from the ideal times the weight
  - Condition points are determined using a preset point value for each condition times the weight
- Good forecast for a picnic if the sum is less than the maximum allowed points (50 pts)

Forecast Condition Point Values

Condition	Points
Sunny	0
Partly Cloudy	0
Overcast	1
Rain	5
Snow	5
Sleet	5
Graupel	5
Lightning	7
Tornado	10

Variable Weights

Variable	Weight
Temp	4.4
Condition	8.3
Humidity	0.1
Wind	3.7

Ideal Values

Variable	Ideal
Temperature	70
Dewpoint	60
Wind	0

Second Observation Belief Determination

Questionable Observations	
Observation	Forecast to Check
Overcast w/ light clouds	Condition
Partly cloudy w/ dark clouds	Condition
Precipitation w/ visible clearing	Condition
Warm (80s °F)	Temperature
Cold (50s °F)	Temperature
Humid (60s °F)	Dewpoint
Breezy (5-14 MPH)	Wind

Bad Conditions	
Observed	Forecasted
Overcast	Overcast w/ dark clouds
Lightning	Precipitation w/ no visible clearing
Tornado	Very warm (temp >= 90 °F)
Snow	Very cold (temp < 50 °F)
Graupel	Very humid (dewpoint >= 70 °F)
Sleet	Windy (wind >= 15 MPH)

Demo

http://pi.cs.oswego.edu/~esumner/COG366WorkSite/project/index.html

Discussion

- Not perfect, BUT we accomplished our goal
- Limitations:
  - Too sensitive to changes
    - 50/50 chance of second forecast being different from observations
    - Not realistic
  - Weights used during belief revision were determined by a survey
    - Would be better to have a larger sample population
  - Forecasted conditions don’t always make meteorological sense
    - Ex: Snow and 60°F

Future Work

- Maybe different approach to belief revision
  - Instead of weighting system
- Make sure forecast makes realistic sense
- See if there's any social science research as to what weather factors are more important when making decisions
  - Instead of a Google Form Survey