

Group 4: Communication and Display of Probabilistic Information

Questions

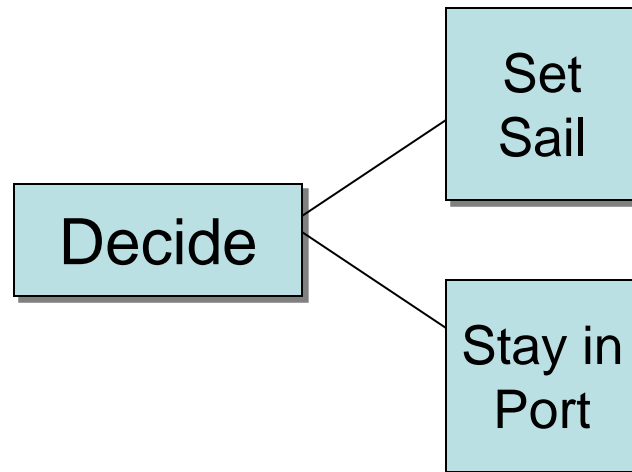
- What are the major deficiencies in our knowledge on how to communicate uncertainty information?
- What studies or tests need to be done to gain the necessary knowledge to deal with this issue?

To realize benefit of uncertainty forecasts.....

- Successful communication is crucial
 - If people do not understand it it is too effortful to understand they will not use it.
- It does not matter how good it is if it is not used.
- It all boils down to a binary decision made by some end-user somewhere <--need to impact that decision.

Problem: Uncertainty Increases Cognitive Load

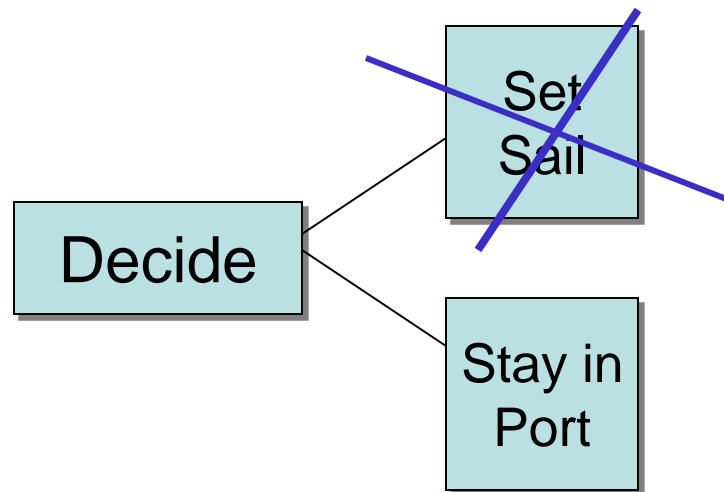
Pleasure boater trying to decide whether to go out....



Uncertainty Increases Cognitive Load

Deterministic Forecast: 30 knot winds!

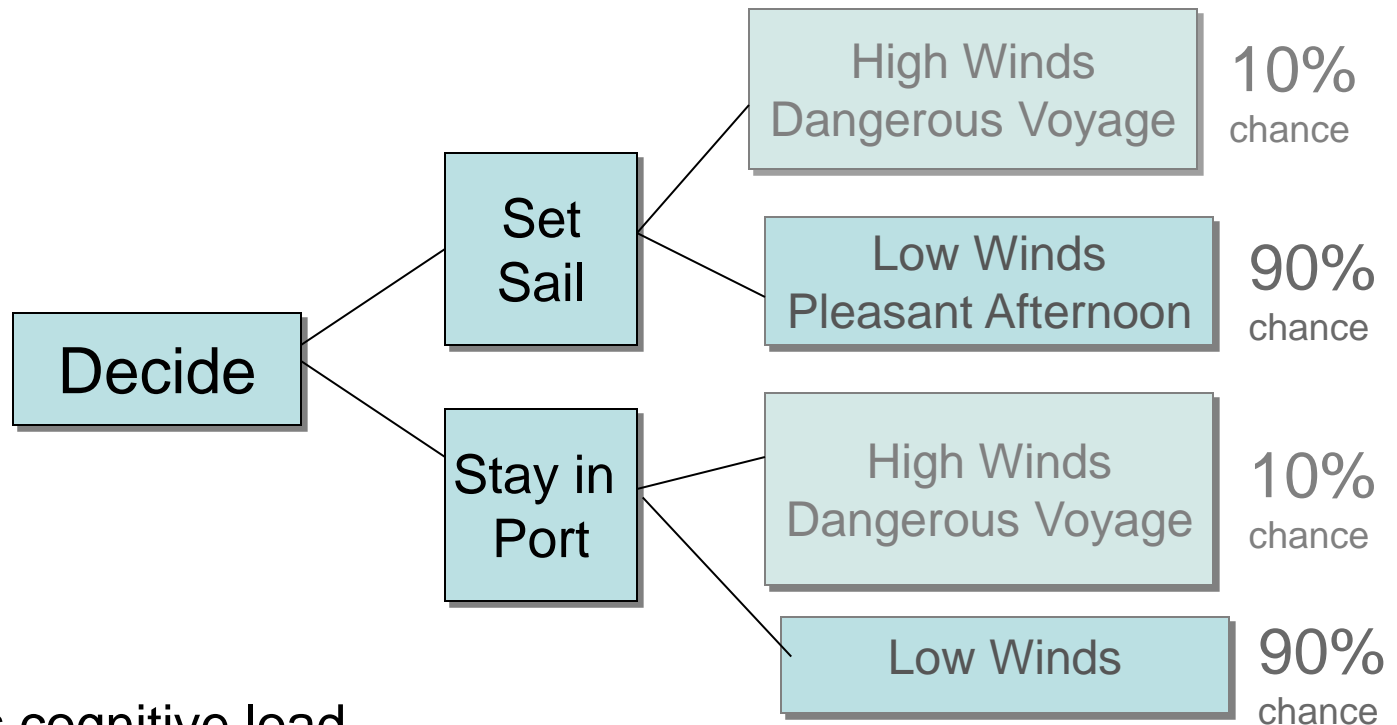
Pleasure boater trying to decide whether to go out....



Uncertainty Increases Cognitive Load

Forecast: 10% chance of 30 knot winds

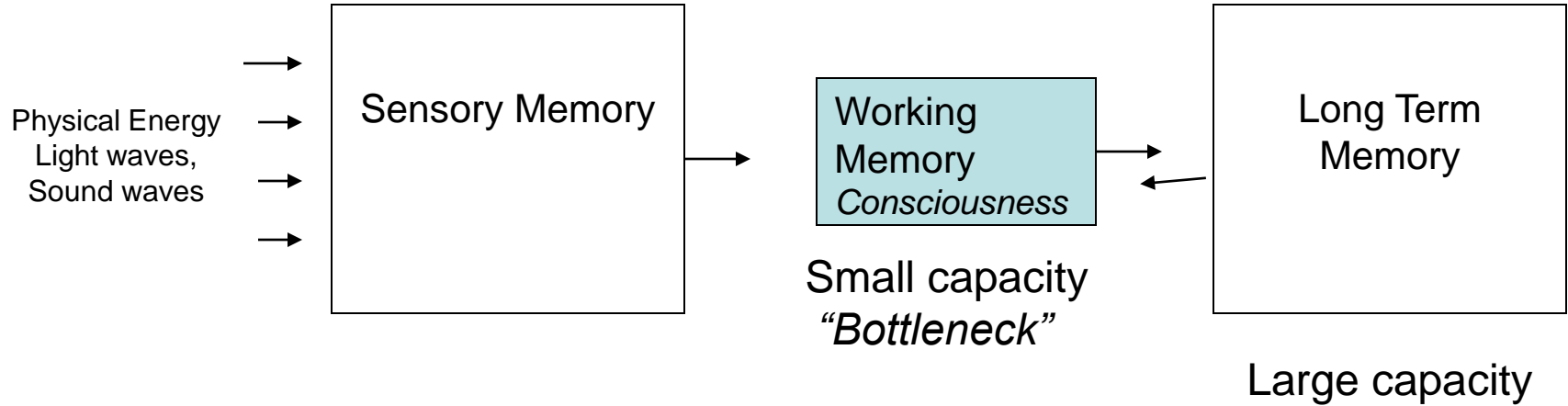
multiple possible outcomes & probabilities



increases cognitive load

(information in consciousness, working memory)

Information Processing Model



Key to communicating uncertainty: Reduce Cognitive Load

- Reasoning with uncertainty is difficult
 - Additional information that must be incorporated in decision process
 - Increase processing load and opportunity for error
- Communicate Uncertainty in a format that
 - Compatible with the decision at hand
(reduce transformation)
 - Compatible user expectations

What Research is Needed

To convince users of the value

- More research showing that people make better decisions with uncertainty forecasts than with deterministic forecast
 - variety of forecasts/situations
 - does it matter whether the decision is repeated or one time?
- Research that looks at the benefits of uncertainty information in group decision-making contexts
- Are there common errors? Means for overcoming?
- Are there differences/similarities expert vs novice?
 - General psychological principles

What Research is Needed

- Experiments that test the benefit of various kinds of uncertainty information and various representations of that information
 - Do people understand it?
 - What information do they derive from?
 - What is better categorical (high/med/low) vs numerical prob.
 - Threshold probabilities/predictive or confidence intervals
 - Frequency versus probability?
 - Number of models in agreement
 - Consequences: number of situations in which your house impacted
 - Presentation formats for complex situations
 - Visualizations
 - What is the best way to communicate risk in low probability high loss situation?

What Research is Needed

- What factors impact user trust?
 - Does forecast variability impact user trust?
 - Does prior forecast error impact user trust?
- How does uncertainty information impact user trust?
 - What presentation formats improve/detract from trust?
 - How does that, in turn, impact decision making?
 - How does that impact user false alarm tolerance?
- Verification
 - Can everyday users understand verification data?
 - How should it be presented?
 - Does it help them to understand probabilistic forecasts?

What research is needed

- Are there special issues involved in communicating forecast uncertainty to forecasters?
 - What data do you give them?
 - What presentation formats?
 - When can forecasters add value to uncertainty forecasts?
 - Do they they need to/can they understand underlying algorithms?
 - How can we overcome forecaster concerns?
 - How will probabilistic products change the role of forecasters?
- Research to find out what key products/information are needed by (other special interests users)
 - What kinds of decisions are being made by end users
 - hydrology
 - wind energy
 - road temperature

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Research on use of Decision Support Systems

- How to best convey information in this context?
- Does it matter that the algorithms are transparent?
- Does it matter whether the user has input in the development
- Does it matter whether the system is flexible

What Research Is Need

- Survey Research

 - who is using forecasts

 - what kinds of decisions

 - understanding of current forecasts

- Conduct relevant experimental research

 - Do not rely entirely on:

 - What people think they want (unconscious)

 - Sometime people are most confident in the format that is worst

 - Existing theoretically motivated research

 - We do not know how known effects (framing effect) play out in complex realistic decision tasks

- Conduct research designed to

 - Get at the practical issues

 - Relevant tasks

 - Elicits optimal performance: Feedback & rewards (motivated)

Questions?