**Note on the inversion of mael’s task**

1. **Description of the task**

* Step 1 :

Subjects **rate** different items that have two dimensions

* Condition : Photo / Sentence
* Domain : Food / Culture / Sport

Phot phrase, phrase toujours plus tard.

* Step 2 :

Subjects **choose** among two alternatives consisting of couples of the different items whose delivery is delayed in time (text)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  | | --- | --- | --- | | Item 1 (now)  Item 2 | Photo  Culture | Sentence  Culture | | Photo  Culture |  | X | | Sentence  Culture |  |  | | |  |  |  | | --- | --- | --- | | Item 1 (now)  Item 2 | Photo  Food | Sentence  Food | | Photo  Food |  | X | | Sentence  Food |  |  | | |  |  |  | | --- | --- | --- | | Item 1 (now)  Item 2 | Photo  Sport | Sentence  Sport | | Photo  Sport |  | X | | Sentence  Sport |  |  | |

Irrespective of their ordering, there are 10 possible pairings of the items.

Considering ordering, there are 16 couples.

Additional info

* Number of sessions : 2 (sessions 1 and 3 in the data)
* Number of choices per session : 72
* Number of choices among item couples per session : 8
* Proposed delays : 0 (now), 1 month, 1 year, 10 years

1. **Organization of data**

The information that is relevant for model inversion on choices is

* Item type & content of both proposed alternatives
* Ratings for both alternatives
* Index of choice

Data

* **y** : N\*1 binary vector (0 for choice NOW, 1 for choice LATER)
* **in** : structure
  + .domain : N
  + .cond : N\*2
  + .side\_delay : N
  + .delay : N
  + .rating : N\*2

Notes on data from Mael

Session 1 & 3 : task with rating

Session 2 : task with money rescaled from 1 to 20

1. **Description of models**

We model decisions as based on delay-discounted values of choices

**Hyperbolic discount**

Subject builds a subjective value of delayed alternative by discounting its immediate value (considered equal to previous subjective ratings)

Where

* : discounted value of choice *i* at time *t*.
* : rating of value of choice *i* at time *t*.
* : discount factor
* : delay of delivery of choice *i* at time *t*

**Exponential discount**

With the same notations as before

**Log representation of time**

Delays presented are 0,30,360,3600.

We propose that delays might be represented through a log-scale

**Softmax decision on discounted values**

Where

* : inverse temperature in softmax decision rule
* : bias toward either
  + Side (left – right)
  + Delay (now or later)
  + Condition (image or photo)

**4. The tricky choice of priors**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Type** | **Parameter** | **Value** | **95%** | **mapping** | **Mapped 95%** | **Justification** |
| **Decision parameters** | Inverse temperature | N(0,10) |  | Exp |  | Positivity constraint |
| Decision bias | N(0,10) |  | none |  | Add to the differences of subjective values |
| Exponential discount factor | N(0,10) |  | none |  | Can get negative -> enhance and discount |
| Hyperbolic discount factor | N(0,10) |  | none |  | Can get negative -> enhance and discount |

**Questions of interest**

1. ***Do subject discount value with time? Compare :***

* Model with no discount
* Model with discount (1 parameter)

1. ***Do subject discount differently per condition\_later (condition) ? Compare:***

* Model with shared **discount factor (df)** between conditions (1)
* Model with different discount factors between conditions (2)
  + Photo
  + Sentence

1. ***Do subject discount differently per condition\_now\*condition\_later ? Compare:***

* 3 couples(now-later)
  + (photo-photo)
  + (photo-sentence)
  + (sentence-sentence)

1. ***Do subjects discount differently per domain (domain)? Compare:***

* Model with shared discount factor between domain (1)
* Model with different discount factors between domain (3)
  + Culture
  + Food
  + Drink

1. ***Do discount depend on couple domain\*condition\_later ? Compare***

* Previous models
* 6 domain\*condition\_later
  + Photo,culture
  + Sentence, culture
  + Photo, food
  + Sentence, food
  + Photo, sport
  + Sentence, sport

1. ***Do discount depend on domain\*condition\_now\*condition\_later***

* ***9 triplets***
  + Photo,Photo,culture
  + Photo,sentence,culture
  + Sentence,sentence,culture
  + Photo,Photo,food
  + Photo,sentence,food
  + Sentence,sentence,food
  + Photo,Photo,sport
  + Photo,sentence,sport
  + Sentence,sentence,sport

To do :

Distinguish

* Condition bias (bias toward a photo)
* Side bias (bias toward a side left/right)