Decision-making In Relationships

Data modelling to predict and analyze psychological decisions in posed romantic contexts

GROUP 9 | ANITA TAM, MAJD MUNA, CAROL LEE, & NOOR GILL

THE TEAM

Anita Tam

atam.447@berkeley.edu

Majd Muna

majd@berkeley.edu

Carol Lee

carollee@berkeley.edu

Noor Gill

noorgill@berkeley.edu

MOTIVATION

01

Decision-Making Tools in Personal Settings

Decision-making analysis is not limited to complex industries, but open to personal settings too. We want to explore that link.

02

Making a Tool for Everyone

We want to incorporate technical decision-making tools into everyday non-technical lives.

PURPOSE

We aim to better understand how one's priorities affect the decisions they would make in our posed romantic relationship contexts of various complexities.

What factors drive decision-making in relationships? How does this change as the situation becomes more complex?

Is it possible to illustrate an individual's values in certain romantic contexts using a numerical model and produce an accurate and "effective" predictor of their response in these situations?

To what extent should this model be incorporated into our romantic lives?

GOALS

01

Moral Value

Analyze which and how much different priorities factor into an individual's decisions in the posed romantic scenarios.

02

Performance

Evaluate how well a mathematical model captures the factors that impact decision-making in the posed romantic scenarios.

03

Accuracy

Evaluate the effectiveness of the designed model in predicting the likelihood of an individual choosing certain alternatives within a decision.

04

Application

Explore whether people should depend on decision-making tools and models when faced with decisions in romantic relationships.

METHODOLOGY

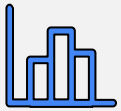
CASE STUDY

Case study of human response and decision-making in situations common in romantic relationships: maintenance of long-distance relationships, communication in those relationships, and decisions regarding marriage.

STEP 1

Large-Scale Survey

Understand what decisions an individual will make given a decision context and a set of priorities. The survey collects data on individual rankings of priorities in addition to the decision that one makes in response to that context.



STEP 2

Model Training

Use a subset of the data as a training set to generate a logit model as our decision-making tool in this project. The ranked priorities in each scenario serve as the independent predictor variables, with strong variables chosen as features in the final model.

STEP 3

Analysis of Results

Apply the model on the test set and analyze the predictions generated to gain insight into the effectiveness and accuracy of our model in capturing the psychological decision-making process mathematically.

SURVEY GENERATION

Format

01. Provide decision context

02. Have the individual assign values to a set of given preferences

03. Provide potential outcomes

04. Have the individual choose a decision from a given list

Presented 3 scenarios, each building off the previous in complexity

Scenario 1: Long Distance

Priorities
- Commitment to your relationship
- Physical distance to your partner
- Your career
- Partner's career

Decisions
- Commit
- Break up

Scenario 2: Communication

Additional Priorities
- Communication
- Your time
- Partner's time
- Sense of security in your relationship
- Will to compromise with your partner

Decisions
- Pause communication
- Break up
- Suggest compromise

Scenario 3: Marriage

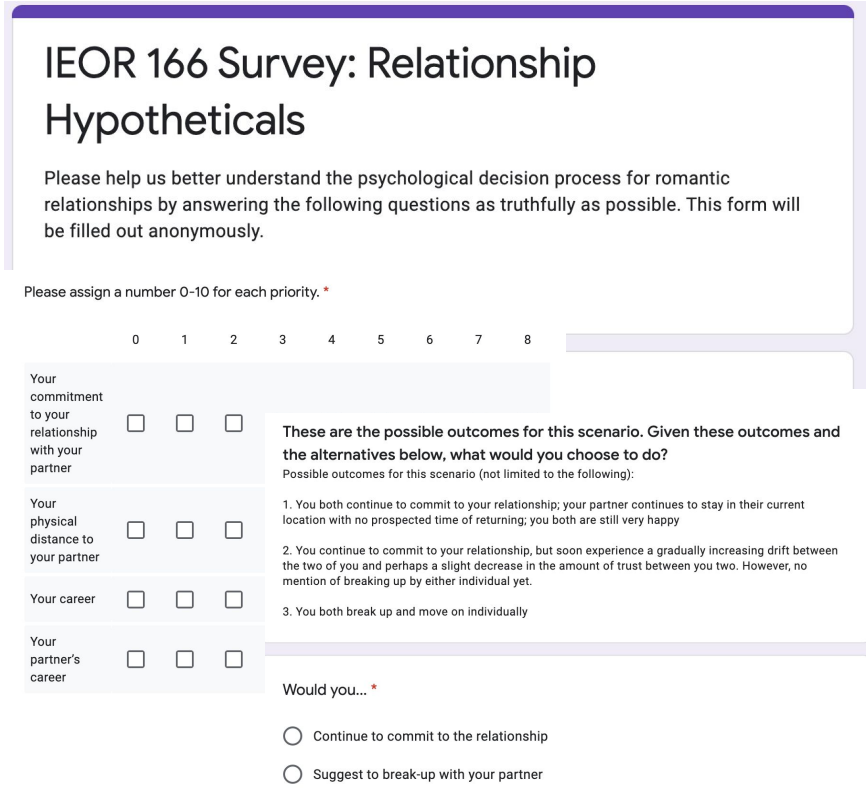
Additional Priorities
- Your family's/friends' satisfaction
- Your personal desire to get married

Decisions
- Suggest the idea of marriage
- Don't bring up the idea of marriage
- Subtly hint at the idea of marriage
- Break up

SURVEY DATA PROCESSING

84 responses total, with the majority in the age range of 18-24

- Individuals ranked each priority on a scale from 0 to 10, with 0 being not important and 10 being extremely important
- To effectively compare rankings between individuals, we normalized the data so that the sum of each individual's rankings equals 100
    - Assumes that individual preferences follow the von Neumann–Morgenstern axioms of orderability, transitivity, and independence: individuals can order/rank their priorities that follow the VNM axioms and priorities are assumed to be independent of each other



IEOR 166 Survey: Relationship Hypotheticals

Please help us better understand the psychological decision process for romantic relationships by answering the following questions as truthfully as possible. This form will be filled out anonymously.

Please assign a number 0-10 for each priority. *

	0	1	2	3	4	5	6	7	8
Your commitment to your relationship with your partner	☐	☐	☐						
Your physical distance to your partner	☐	☐	☐						
Your career	☐	☐	☐						
Your partner's career	☐	☐	☐						

These are the possible outcomes for this scenario. Given these outcomes and the alternatives below, what would you choose to do?

Possible outcomes for this scenario (not limited to the following):

1. You both continue to commit to your relationship; your partner continues to stay in their current location with no prospected time of returning; you both are still very happy

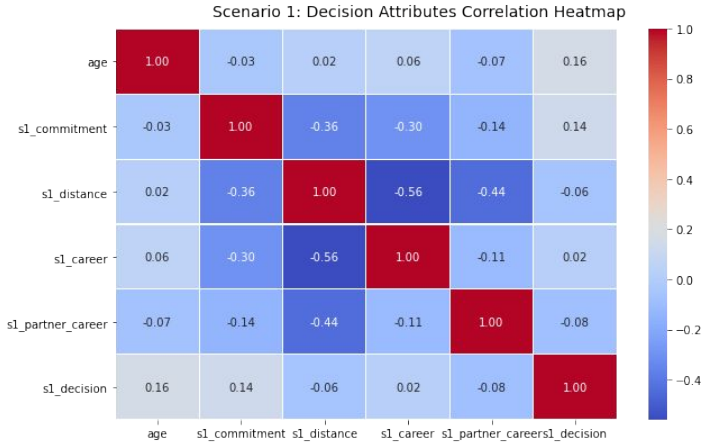
2. You continue to commit to your relationship, but soon experience a gradually increasing drift between the two of you and perhaps a slight decrease in the amount of trust between you two. However, no mention of breaking up by either individual yet.

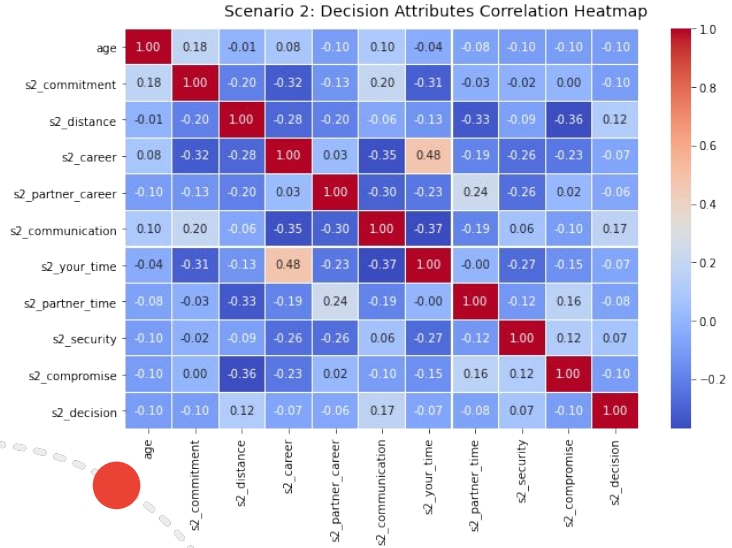
3. You both break up and move on individually

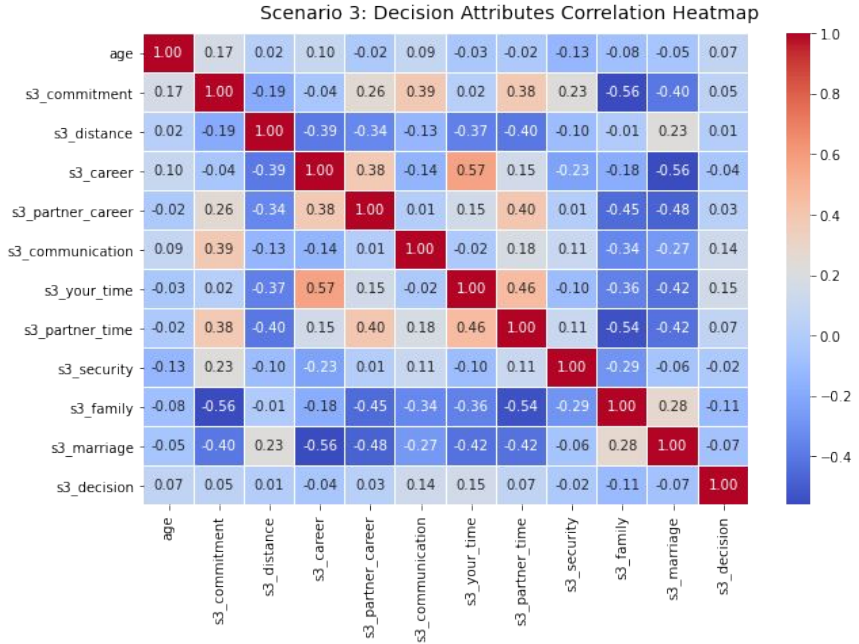
Would you... *

- ◯ Continue to commit to the relationship
- ◯ Suggest to break-up with your partner

EXPLORATORY DATA ANALYSIS







LOGIT MODEL TRAINING

→ Linear combination of individual's value for each priority resembles one's subjective utility function
→ Predictions of likelihood are nicely interpretable

For each scenario:

01.

Train / Test Split

- Split 80% of the data for training, 20% for testing
- Randomly split the data while keeping the proportion of each class the same in both sets

02.

Data Balancing

- Heavy class imbalance
- Tried several methods of data balancing, including adjusting weights and oversampling

03.

Cross-Validation

- Prevent overfitting to the training data
- Used 5-fold cross-validation to select best features

FINAL MODELS

Scenario 1: Long Distance

Data Balancing

- Random OverSampler

Features

- Age
- Commitment to your relationship
- Physical distance to your partner
- Your career
- Partner's career

Scenario 2: Communication

Data Balancing

- SMOTE

Features

- Age
- Commitment to your relationship
- Physical distance to your partner
- Communication
- Partner's time
- Sense of security in your relationship
- Will to compromise with your partner

Scenario 3: Marriage

Data Balancing

- SMOTE

Features

- Age
- Communication
- Your time
- Partner's time
- Your family's/friends' satisfaction
- Your personal desire to get married

RESULTS

SCENARIO 1

92%

Continue to commit to the relationship

VS

8%

Suggest to break-up with your partner

For every 1 unit increase in value of a feature/priority, the odds of...

Features / Priorities	Continuing to Commit to the Relationship vs. Breaking Up
Age	1.16
Commitment to the Relationship	1.03
Physical proximity / distance to partner	0.92
Your career	1.07
Your partner's career	0.86

SCENARIO 2

29% temporarily pause communication with each other

VS

58% suggest communicating less than before

VS

13% Suggest to break-up with your partner

For every 1 unit increase in value of a feature/priority, the odds of...

Features / Priorities	Temporarily Pause Communication	Suggest Communicating Less	Suggest to Break-up
Age	1.37	1.47	0.49
Commitment to the Relationship	1.02	1.15	0.85
Physical proximity / distance to partner	0.95	0.89	1.18
Communication	0.66	0.74	2.06
Your partner's time	1.67	1.76	0.34
Your sense of security in the relationship	0.94	0.91	1.17
Your will to compromise with your partner	1	0.83	1.21

SCENARIO 3

VS

VS

VS

For every 1 unit increase in value of a feature/priority, the odds of...

Features / Priorities	Suggest marriage to your partner	Dismiss family/friend suggestions of marriage	Hint at Marriage to Your Partner	Suggest to Break-up & Move on
Age	1.07	0.91	1.11	0.92
Communication	0.95	0.82	0.86	1.48
Your time	0.48	0.92	0.77	2.93
Your partner's time	1.76	1.39	1.41	0.29
Your family's/friends' satisfaction	1.13	1.33	1.11	0.60
Your desire to get married	1.1	0.71	0.96	1.33

HOW "ACCURATE" IS THE MODEL IN MAKING PREDICTIONS?

SCENARIO 1: STAY VS BREAKUP

5 PRIORITIES: Age, Commitment, Distance, Your Career, Your Partner's Career

67%

SCENARIO 2: PAUSE CONTACT, TALK LESS, OR BREAKUP

10 → 7 PRIORITIES: Communication, Security, Compromise...

55%

SCENARIO 3: MARRIAGE? NO MARRIAGE? BREAKUP?

11 → 6 PRIORITIES: Family & Friends Concern, Desire to Marry...

44%

IMPLICATIONS AND LIMITATIONS

IMPLICATIONS

Contextualizing the final model

Effectiveness

Is the model an effective predictor?

- Accurate identification of relationship priorities and correlation with decision.
- Generally accurate decision results

Usability

Should this model be used for rational decision-making in relationships like those posed?

- Utilized as a reference for decision-making, rather than an ultimatum
- Mechanizes the human-human relationship aspect in romance

Qualitative Analysis

As a whole, how does societal decision trend change as the complexity of the situation increases?

- In our findings, society tends to choose alternatives that allow them to maintain their relationship rather than splitting despite additional concerns.

LIMITATIONS

- External Factors: additional factors or priorities not encompassed by the survey (such as time and intimacy levels) could have acted as confounders in decision-making
- Small Sample Size: not enough data points sampled and unbalanced across classes, which impacted model accuracy
- Generalization: scenarios may not be representative of all common relationship scenarios or have the capacity to test all individual values
- Age Range Restrictions: due to time constraints and nature of data collection, we were only able to sample from a population of individuals aged 18-24

SUMMARY

1

Objective

- Is it possible to create a simple and effective mathematical model based on individual values as utilities to predict psychological decision-making in certain romantic scenarios?

2

Methodology

- Surveyed 84 people
- Analyzed how the rankings of priorities affect the decision individuals make in 3 increasingly complex scenarios
- Used rankings as a utility measure and assumed individuals followed VNM axioms.

3

Results

- As the complexity of our scenarios increases, the accuracy decreases
- However, we do see that the model captures many psychological intuitions.

4

Implications & Limitations

- Analysis shows that modeling romantic decisions in this form generally yield accurate results and may be a good tool to aid romantic decision-making
- Limitations include small sample size, inaccurate generalizations, lack of diversity in age ranges, and additional external factors unaccounted for in the data.

Relationship Decision-Making Cannot be Standardized

Rational relationship decision models need personalized prediction, rather than standardized prediction

Dynamic Situations Affect Individual Priorities

Relationship priorities are not constant, but rather change depending on the situation, and algorithms need to account for that

Visible Correlation Between Decisions and Priorities

As complexities grow among relationship decisions, more factors come into consideration that affect decisions

Algorithms Can Integrate Personalized Rationality

Models can be built based on an individual's priorities to give personalized predictions and direction towards rational decision-making

FUTURE APPLICATIONS

Data Collection

1. Larger, More Diverse Sample Size
2. Core Features For Each Decision
3. More Scenarios Included

Model

1. Decision Trees
2. Probit Model
3. Hyperparameters

Hybrid Approach

1. Perspective of Relationship Experts/Therapists
2. Hybrid Tech Potential

Thank you !