MECN-452: Game Theory
Team Ate: Eknoor Sethi, James Cavanaugh-Gialloreto, Maggie Christensen, Kailin Jiang
Final Paper

Modern Dating with Game Theory

TINDER & HINGE OVERVIEW:

Relationships have always been a crucial part of our lives, but with the rise of the digital dating world, online apps have dominated the newfound dating scene. Dating apps like Tinder and Hinge have changed the way newer generations approach dating and have shaped our romantic lives through algorithms and strategic behavior. Although dating has always been strategic, online apps involve a different type of game theory strategy. Within our paper, our group wanted to analyze the strategies involved in finding your best match through these algorithmic apps.

Tinder and Hinge are two of the most dominant online dating apps. Tinder provides users with a quick swipe left or right, requiring minimal effort, essentially sending signals as to which profiles users find attractive and interesting. Tinder creates a dynamic platform where users make simultaneous decisions on whether to pursue a match or not. Hinge has branded itself as the app that's "designed to be deleted", providing its users with a bit different experience than Tinder. Hinge introduces a more curated experience where users can engage with profiles by responding to prompts and liking specific photos, opening up opportunities for conversations. Hinge promotes a higher-effort environment, providing a high-risk, high-reward mentality. Tinder and Hinge represent two versions of the dating scene – one being driven by quicker, instinctual reactions to profiles and the other being driven by more selectivity, effort, and signaling.

TINDER:

Tinder is the most popular dating app, with 30% of dating app users actively using it within the last 12 months (Business of Apps). With some of our group members being a part of that 38%, we noticed that Tinder offers a fascinating real-world environment for applying game theory concepts. With each swipe, match, message, and profile picture shown, there are various strategies and decisions to be made. In this environment, Tinder promotes asymmetric information, low communication costs, and a fast-paced, high-volume structure. Our group wants to explore how Tinder is essentially just a giant conglomerate of simultaneous move games. Beyond that, to maximize our luck on Tinder, we must articulate how crucial it is to understand how mixed strategies, signaling, and the algorithm are game theory lessons masked in the context of a dating app. Furthermore, we hope to highlight how swiping on Tinder and looking for a connection could be viewed as a game of Beauty Contest, or a separate game with its game table.

Simultaneous Move Game

To start, we want to frame the basic function of Tinder's swiping interaction as a simultaneous move game. Users are required to come up with a profile of pictures, prompts, and responses to fun questions that give other users insight into who they are. Independently, users can see who is in their vicinity, and choose whether to swipe right (interested) or swipe left (not interested), without knowing the decisions of the user you swiped on. This perfectly encapsulates what a simultaneous move game is. Users swipe on individuals without knowing if the other person swiped to the right, liked a profile, or swiped to the left, disliked a profile. For example, let's say there are two users, Sam and Alex, neither of whom knows the other's preference before swiping.

Individuals can swipe right to indicate they liked a profile and are interested in matching, or they can swipe left, indicating they are not interested. If both individuals swipe right (mutual like), they will match and both get a positive payoff. If one swipes right and the other swipes left, then the individual who liked

a profile essentially loses and gets no match. If both individuals swipe left (neither likes), then nothing happens, and there is a zero payoff.

	Alex swipes right (like)	Alex swipes left (pass)
Sam swipes right (like)	(1,1)	(1,-1)
Sam swipes left (pass)	(-1,1)	(0,0)

This game table of a simultaneous move game shows a Nash equilibrium when both players swipe right, liking either other's profiles and ultimately matching. This scenario assumes that both players have a basic account; both players (Alex and Sam) benefit and receive a positive payoff, which is a potential connection. If both players swiped left, then the payoff is 0. If one player swipes right and the other swipes left, the payoff is -1 and the cost is rejection.

Mixed Strategies (Swiping)

Dominated strategies are ones that always result in a worse or equal outcome compared to another strategy, regardless of what another player does. With a basic Tinder account, there are two main dominating strategies. One dominated strategy would be swiping left (pass) on everyone; if an individual’s goal is to match with another person, then swiping left every round is strictly dominated. Swiping right (like) occasionally is the dominating strategy here. The second dominating strategy is to swipe selectively to obtain a match; this strategy is dominated by swiping right on everyone. This is a conditional domination, assuming the algorithm allows a user to swipe right on every profile. The problem with this could be a dilution in the algorithm, as it will not be able to understand a user’s preference and thereby suggest potential low-quality matches. However, if a user simply just wants to

match with another person (for whatever reason they may have), swiping right 100% of the time is the dominating strategy.

Mixed Strategies (curating)

Beyond mixing up your swiping strategy. Tinder's unique identity as a dating app encourages users to adopt a mixed strategy in their content creation to maximize their chances of connection. This is because Tinder has narrower intentions compared to its peer dating apps (Hinge for relationships, Bumble for friendships, etc). Tinder has evolved into a multipurpose platform where users can seek hookups, serious romance, and even friendship through Tinder. This lack of clarity in what varying users are looking for is the main reason mixed strategies make sense for users to employ.

In game theory, a mixed strategy involves randomizing your behavior to prevent your opponent from predicting your next move. Applying this to Tinder, your "opponents" are the other users deciding what direction they want to swipe on you. Normally relying on snap judgments, if the profile is curated to fit a pure strategy (e.g., only gym pictures, only goofy pictures), the user is very easy to categorize and even easier to reject. If you create a profile that balances flirtation, style, and humor, you are harder to categorize, and your strategy is more unknown. Even if you are looking for romance and want to appear attractive, on paper, it is in your best interest to present your most glamorous or revealing photos if appearing attractive is the goal. However, mixed strategies tell us that appearing too narrow with a pure strategy could be more harmful than good: predictability decreases your appeal across the spectrum of users. By highlighting the aforementioned reasoning, we believe the user will have the highest chance of being swiped right on by more than 1 type of other user (the various second players you engage with).

Furthermore, since many people have multiple dating apps, if diversifying your Tinder profile doesn't feel right, you can extend mixed strategy curation across platforms. For example, portraying yourself as more playful on Tinder, while reserving romantic taste for Hinge, allows you to diversify your presence in the

larger market of online connections. To summarize, if you just have Tinder as your dating app of choice and your goal is maximizing matches, then a mixed strategy profile is smarter. If you have multiple dating apps, then you can also use mixed strategy curation by presenting yourself more narrowly on Tinder, then express yourself differently on the other apps: mixed strategy maximizes your odds, it just depends on how you implement it within or across the apps.

Beauty Contest

Lastly, on Tinder, there are striking parallels to the game "Beauty Contest." The beauty contest, where players pick a number 0-100 and win if they get closest to ⅔ of the average of everyone else's guesses, is all about second order thinking and predicting what others will choose. Both of those are crucial in Tinder. In the game of Tinder, players are trying to guess what others will find attractive. They aren't going based on their perception of attraction, but on others' perceived version of what is attractive. This is similar to players trying to guess not what they think the average will be, but what others will perceive ⅔ of the average to be and go off of that. This recursive loop of second-order thinking is evoked in dating apps and manifests in the thought of "what kind of person do I think my ideal match is attracted to… and then how do I portray that?"

Mimicking the optimal strategy in a beauty contest of predicting what others will do, Tinder's optimal strategy is deliberately crafting a profile that aligns with prevailing trends while standing out enough. Users may elect to use gym pictures, photos of them fishing or with dogs, or travel pictures, not because it aligns with them, but because these elements are perceived to be attractive to others. In essence, Tinder is a digital beauty contest where users are attempting to balance authenticity with social expectation.

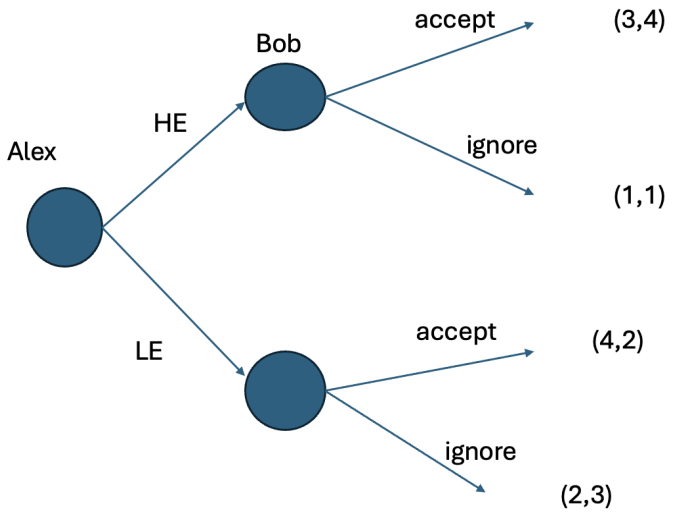
HINGE:

Hinge is also a popular dating app, but it differs significantly from Tinder in that it focuses on users who are seeking more serious relationships. Its slogan, "the dating app designed to be deleted," reflects this emphasis on long-term commitment. Unlike Tinder's swipe-based approach, Hinge lets users like or comment on specific photos or prompts in someone's profile, which makes interactions feel more thoughtful and personal. The app also puts limits in place to prevent users from liking too many people at once or juggling too many conversations. For example, if someone has eight or more chats where it's their turn to reply, they won't be able to send new likes until they respond or end those conversations. These features push people to be more selective and only choose to communicate with people whom they are genuinely interested in.

Sequential move games

While Tinder can be modeled as a simultaneous-move game, Hinge is more accurately represented as a sequential-move game. Suppose we have two users: Alex (Player 1) and Bob (Player 2). Bob posts his profile on Hinge, and Alex browses Bob's profile, chooses to send either a high-effort (HE) or low-effort (LE) response (comment or like). Bob then observes this move, sees the content and effort, and decides whether to accept (match) or ignore the interaction.

Below is the decision tree representing this interaction:



Using backward induction, we can determine the optimal strategy. If Alex sends a high-effort like, such as a thoughtful comment on a meaningful prompt, Bob will be more likely to accept. If Alex sends a low-effort like, Bob is more inclined to ignore. Anticipating Bob's reaction, Alex is incentivized to strategically curate his comment and invest more effort to increase the chance of a match.

While Alex has more initial information as the one browsing Bob's profile, Bob holds the strategic second-mover advantage in the game itself. Once Alex makes the first move, Bob observes the type of like (high-effort or low-effort) and then chooses whether to accept or ignore it. This structure gives Bob more power at the response stage, even though Alex initiates with more information.

Signaling

Compared to Tinder, Hinge gives users more ways to express themselves, which makes signaling a bigger part of how people interact. On Tinder, profiles are limited to a few photos and a short bio, and the only action users can take is swiping left or right. Once matched, there's often little context to start a meaningful conversation, making it hard to tell who's genuinely interested and who's just casually browsing.

Hinge is different by design. It encourages users to share more through prompt answers, multiple photos, and profile details. These features allow users to communicate personality and intentions upfront, even before any interaction occurs. A well-written prompt can show humor or thoughtfulness, and sharing specific preferences, such as "wants kids," "loves reading," "favorite music genre," helps signal compatibility.

These signals help reduce uncertainty in a setting with asymmetric information, where people don't know each other's true intentions. Unlike in Tinder, where intent is harder to read since, as mentioned above, it is a multipurpose platform, Hinge users can send clearer signals both through their profile content and

how they choose to engage. This adds a layer of strategy to how users present themselves and who they choose to interact with, which indicates signaling theory: serious people tend to send costlier, more thoughtful signals, which are more likely to be believed and rewarded.

Reputation & Feedback Loops

In comparison to Tinder, Hinge offers a feature that allows users to see profiles that the algorithm thinks would be most appealing to them – "Standouts" – and allows users to send "roses" to profiles to show higher interest. These features allow for reputational feedback mechanisms within the Hinge algorithm, which are perceived as high-signal actions in an environment that may be inconsistent.

In terms of game theory, this aspect of Hinge is strategically framed for users to be careful when handing out roses within the app. When a user sends another user a rose, it's considered costly since it's a limited resource, which signals to the receiving user that they are experiencing another user showing high interest. With reputational feedback loops, the Standouts feature is curated algorithmically, which represents the pattern of prior behavior. Further, with a repeated game, users who engage in costly, high-risk, high-reward scenarios and show effort, such as sending roses, are rewarded through Hinge's algorithm.

Here's a game table that represents the payoffs of sending a rose within the Hinge app:

	Respond to rose	Don't respond to rose
Send rose	(4, 4)	(-1, 1)
Don't send rose	(2, 2) → [regular match; Player 1 doesn't send rose but	(0, 0)

	reaches out + Player 2 responds to the message]	

Essentially, in this game table, both players get the highest payoff if they both show a high-signaling of interest. Although sending a rose results in a potential payoff, it's costly since roses are limited and there's no guarantee that player 2 will respond. The Nash Equilibrium is for player 1 to send a rose and player 2 to respond to that rose, resulting in a (4, 4) payoff. Further, in this game matrix, there is no dominated strategy for either player.

Negotiation

Compared to Tinder, Hinge provides users with the ability to personalize their profiles a bit more through having prompts for other users to respond to. The app's prompt & comment feature creates a point of friction for users as they must decide how much effort to invest in certain profiles.

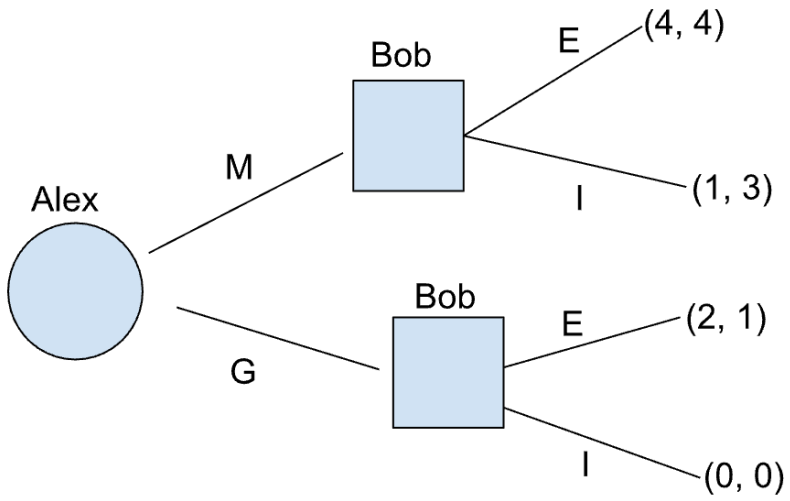
This feature is strategically framed by showing a higher interest in a profile due to making the effort of responding to a prompt instead of simply liking a profile, which could be more costly (of time and effort). Playing into negotiation and bargaining, the question comes down to who will send the message first. Further, this allows for a second-mover advantage since the receiving end can respond based on how much they're interested in the initiator.

Essentially, if neither player messages the other, the match dissolves and doesn't go anywhere. If one player messages first, it allows for control over the direction of the conversation. This game structure represents a Stag Hunt since mutual interest leads to the best outcome for both players, but defection and creating a chase become tempting.

Repetition & Reputation

Hinge resurfaces profiles on users' feeds who didn't previously match, but the algorithm thinks would be a good match based on patterns in behavior on the app. This feature creates a repeated interaction environment for users to allow for greater chances in matching, especially for those in locations that may have smaller dating pools and options.

Here's a game tree explaining this scenario through the Hinge app, where "M" stands for message, "G" stands for ghost, "E" stands for engage, and "I" stands for ignore:



Essentially, in this game table, the best outcome is if both players indulge in the conversation where player 1 messages first and player 2 engages in the conversation, (M, E) or (4, 4). In (M, I) or (1, 3), player 1's efforts are wasted at a higher cost due to messaging first, whereas player 2 gets the opportunity to disengage from the conversation. In (G, E) or (2, 1), player 2 interacts with player 1 first this time around in the resurfacing, but player 1 decides to continue to disengage. Finally, with (G, I) or (0, 0), neither player wants to engage again, so neither player has any sort of payoff.

Within this game tree, ghosting is weakly dominated by messaging for player 1, depending on the way player 2 will respond. If player 2 is the type of person to engage, then messaging for player 1 gives a higher payoff than ghosting. However, if player 2 ignores player 1, then messaging first still has a slightly higher payoff than ghosting. For player 2, there are no dominated strategies since their decisions are conditional on player 1's choices.

Scarcity

Hinge's algorithm has a cutoff on how many people users can like in a day (limiting to 8 active conversations in a day) without the premium subscription. This feature shows the scarcity aspect of game theory and the dating app algorithm, which pushes users to be pickier with their conversations, and/or want to pay more for more conversations.

This feature also allows users to be more strategic in their conversations within the app, ultimately choosing to engage with other users who are deemed more likely to respond. Users are also incentivized to delay their gratification, essentially not falling into the trap of a shorter game, or to act impulsively. Further, tying back to the OPEC simulation, users aren't aware of how short or long the "game" or relationship will last, or when they will run out of likes or conversations for the day. This leads to incomplete information resulting in an indefinite game, which also creates the incentive for users to behave more strategically and "cooperate" earlier in the "game".

GAME THEORY & ONLINE DATING:

Dating, relationships, and online apps are more than just social platforms – these tools are environments where users must be strategic with their interactions. This paper demonstrated the way game theory concepts play into the real world, and especially in an aspect of our lives that is crucial to our everyday relationships, whether they be romantic or friendships. Dating apps like Tinder and Hinge are great ways to find new people and try to make meaningful connections, but oftentimes, we forget how all relationships and interactions are essentially just strategic games. By applying game theory tools like dominated strategies, repeated game dynamics, signaling, Nash equilibrium, and bargaining, we can better understand how to navigate dating in the modern world and how to approach it emotionally, rationally, and strategically.

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