How the Robot Plays (1-20)

BuckwheatECG buckwheat
Adapted from the work of 卷个饼饼

This article series is adapted and translated from videos explaining the decision-making of the robot LuckyJ playing on Tenhou. In 2024, the best robots play comparably well to the best human players, but they don't tell us why they do what they do. Each article in this series examines one hand in depth, to translate the "what" we see to the "why" we can learn from. The title of each hand (Hand 1, etc) are links to the original videos.

Hand 1

The robot has a big lead in South 1. Its starting hand has potential to be a flush.

Many people seldom open with this big of a lead. However, latest data shows top players, human or robot, actually open slightly more in this point situation than flat scores. This pushes the robot to open what would otherwise be a 50/50 decision.

While this hand can be a flush, it doesn't need to be. It can be completed with White Dragon as the only yaku. This, and the fact that the robot highly values safety from honor tiles, makes it **pon and discard 5p** (instead of 4s, which can be useful upon drawing dora).

A more usual approach is to pass, discard lone winds, aiming to draw tiles near 5p and 4s, eventually pon White Dragon and open once or twice more for tenpai. The disadvantage to this is the likelihood of the hand being open in the midgame without safe tiles and forced to push into danger. With such a lead, this plan is inferior to opening.

The robot draws dora and **discards South**, pivoting away from a flush. Unlike some humans, the robot evaluates which hand to pursue without factoring in the sunk cost of "committing" to a flush with its previous 5p discard.

When deciding whether to pursue a flush, many humans start off leaning towards the non-flush hand by discarding winds first, commit to a flush only if they draw lots of tiles in their suit, and refuse to pivot after committing. This is a limiting way to play that can cause many errors.

Note that the robot discards South first because it already expects White Dragon as a yaku and doesn't need another. If a wind becomes a pair, the hand is a flush, so South being yakuhai is irrelevant. The honors provide plenty of safety, so South being seen once and therefore safer also doesn't matter.

Here the robot **calls pon and discards 1m**. 1m is barely more useful than an honor for speed given the 457m holding, and a far greater defensive liability.

Discard a wind, or break 46s?

The robot **discards 4s**. This is slower than discarding a wind, but discarding 4s has two advantages: final shape and safety. With two good shapes and two lone honors, the final wait can only be open wait or single wait on an honor. The hand will never be stuck waiting for 3 copies of a middle tile. For safety, two honors are vastly superior to two middle tiles close to dora.

Note that despite its previous discard, the robot doesn't consider itself committed to a non-flush hand and tunnel-vision into discarding a wind here like some humans would.

The discard is 4s instead of 6s because both are too dangerous to push into a riichi, so 6s isn't "more dangerous" to the point of influencing which to discard.

Another thing to learn here is safe tiles increase in value as the hand is opened more times. This is because it's harder to find safe tiles "by accident" in a shorter hand, so safety can only be achieved by saving safe tiles on purpose.

The robot **discards 6s** to preserve a safe tile. There's no reason to try to pair the dora when the hand is mangan without it.

The robot **calls chii and discards West** to break ippatsu and fight the riichi. The safe tile proved useful.

The robot wins, mangan.

Closing

This hand shows how early turns must be played with care and thought and aren't as simple as unthinkingly discarding useless winds. The robot's first few decisions were all interesting, challenging, nuanced, and easy to get wrong. It got lucky in the end, but if it played the early turns differently, it would have folded to the riichi and not had the chance to get lucky at all.

This hand shows the value of evaluating each turn independently instead of committing to a hand shape throughout, of keeping safe tiles, of not being afraid to open even when leading, and of final wait shape. Studying similar game logs can be a boon to your skill in navigating similar choices, and perhaps in seeing that they are choices in the first place.

Hand 2

The robot leads by less than a mangan tsumo in East 4. Its starting hand can obviously become a flush. Since South is a guest wind, keeping 7m and 7s means the hand will most likely remain closed, which is not much (if at all) faster than an open honitsu with mangan potential. Thus, LuckyJ **discards 7m** and chooses a flush as the hand's main direction.

Note how West is not the correct discard. Since the hand currently has 4 blocks for a flush, and any of the lone honors can become the fifth, they are all too valuable to throw away.

Discarding 4p would be a grave error even though it fixes dora, maintains 4 blocks for a flush, keeps all lone honors, and maintains effective tiles around 7m and 7s. This is because 445p can easily grow into a complex shape to serve as the hand's fifth block.

On the 2nd turn, the robot **pons South and discards 7s** to continue pursuing a flush. A few useless draws (including red 5m, which doesn't fit into the hand's plan) later, it now faces discarding 4p or an honor.

The robot **discards 4p** and fixes dora because its ability to become a triplet and to form complex shapes both became less valuable when the hand gained its fifth block. Furthermore, it is a defensive liability in case the hand needs to fight against riichi, which it is strong enough to do.

The robot **calls chii and discards Red Dragon** to break ippatsu and fight the riichi. With good shapes, four safe tiles, decent value, and no dangerous tiles to discard on the way to tenpai, this play is obvious.

The very next turn, it faces another decision. Given the hand's shape and value, 4m is safe enough to push. It is half-suji, two 3m and two 5m are visible, and a 14m wait is unlikely due to the right-hand opponent discarding 3m then dora to declare riichi (why this makes a 14m wait unlikely is out of this article's scope).

The choice, then, is whether to push 4m now to save West for an even more dangerous situation such as another riichi. The robot decides that with its lead, with two Norths as backup safe tiles, with its hand's final shape being less than ideal (middle tile ryanmen waiting on dora or terminal shanpon with 1 seen), it will most likely fold completely upon facing two riichis. Therefore, there's no reason to save West for that situation. It **discards West**.

The robot draws a dangerous tile. The dealer has discarded 8 suji, leaving 10 remaining live ones, and 4s deals into two of them. This puts 4s at about a 20% chance to deal in. Not only that, both 4s and 4m need to pass for this hand to win. This overall deal-in rate of nearly a quarter, not counting drawing more dangerous tiles later, is too high to justify pushing. So, the robot folds completely by **discarding North**.

Notice how the robot's earlier decisions accounted for this possibility of using North as backup safe tiles, and how its previous decision of keeping 4m is justified here since it never needed to push 4m at all.

This discard also shows push-fold decisions must be reevaluated every turn, as the correct move can go from fully attack to fully defend in as little as one draw.

A few turns of folding later, the robot draws into tenpai without yaku by **discarding 4m**, also the safest option.

The robot collects noten-bappu by drawing only safe tiles until the end. This is lucky, but not extraordinary so, made possible by the cumulative effect of its previous choices.

The dealer was indeed waiting on 4s, though this doesn't affect the previous analysis.

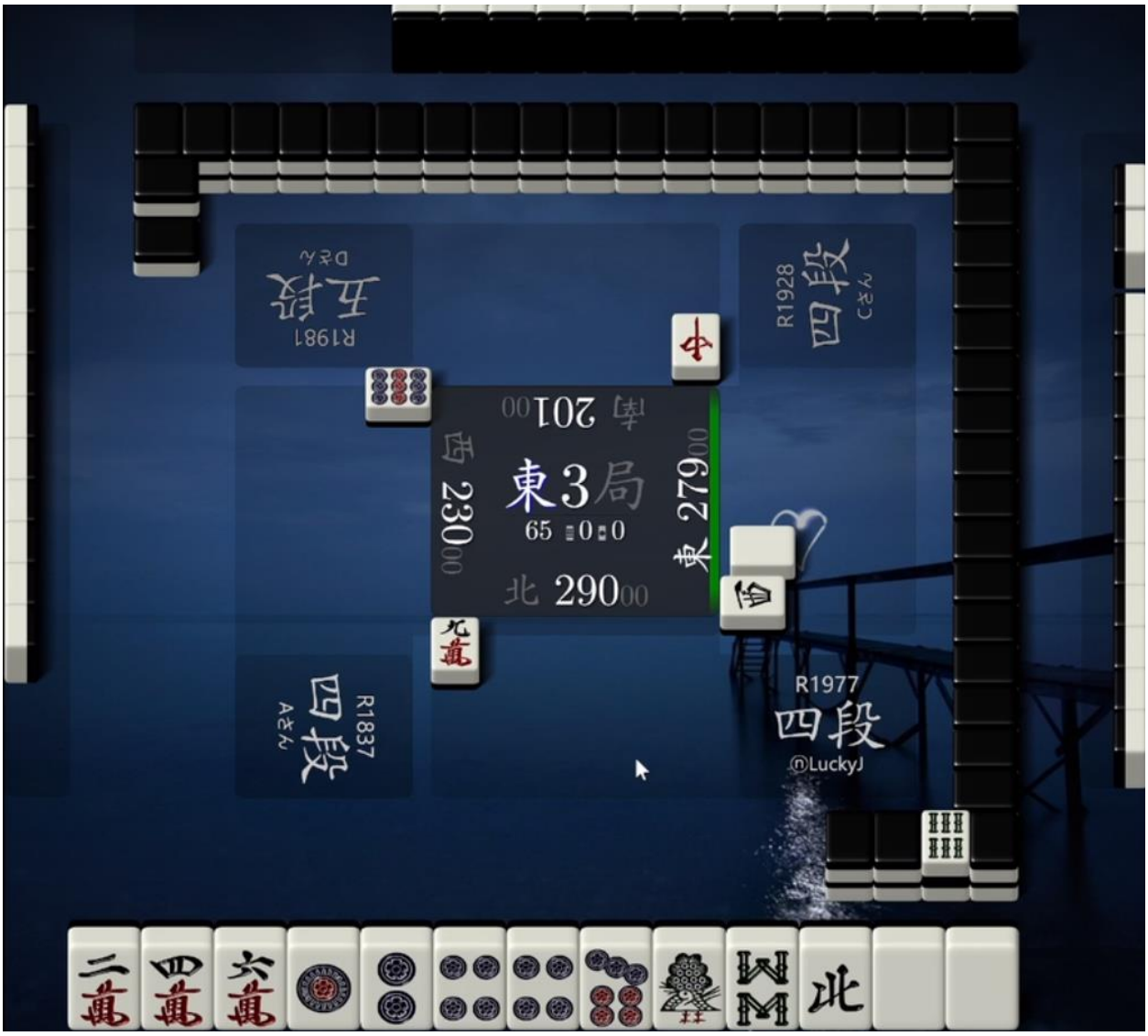
Closing

This hand shows how the value of complex shapes and floating tiles change depending on the rest of the hand. It also shows the importance of of shedding defensive liabilities to afford flexibility later, of considering the hand's future paths when making present decisions, and of reevaluating the push-fold decision every turn. Furthermore, a far stronger hand is required to push against two opponents than one. A 3-han hand with guaranteed semi-good final shape doesn't qualify.

The other lesson is, when defending, to preserve a chance for winning noten-bappu when able. Doing so often entails little additional risk. The robot used some other techniques like counting suji and reading discards to estimate safety, but these are relatively unimportant and can be considered trivia.

Hand 3

The robot is in East 3 with a tiny lead and mostly even scores. Its starting hand is poor but contains a pair of yakuhai.



The first decision is whether to pon. For Riichi Book 1-educated players, passing is almost automatic, because the resulting hand will be cheap, slow, and missing two white dragons, its best defensive assets.

However, the robot **calls pon and discards 1s** here. Robot play has shown that there are ways to play open hands without sacrificing safety. Because this hand has such poor shape, it is almost impossible to complete closed. Passing amounts to folding on turn 2, unacceptable given the score and round. The plan is to rush an open hand while preparing to defend.

In general, bad shapes favor opening. Since bad shapes “need more help” than good ones, the speed gain from opening grows with the number of bad shapes held.

What to discard here? North seems natural, 7p or 8s to save North as a safe tile also seem plausible. But the robot, surprisingly, **discards 2m**.

To understand this, evaluate the hand using three criteria. It has poor speed, no value, and little defense. Every pinzu plus North provides value via outs to a flush. North is the hand's only safe tile. 8s provides value by being able to accept dora. The only remaining discard candidates, then, are 2m and 6m. The robot decided that the outside chance of gaining red 5m is worth more than setting up a suji trap.

The speed loss from discarding 2m is not as big as it seems. Firstly, the hand is 3-shanten with all bad shapes and doesn't have much speed to lose. Secondly, North must be kept for safety, so 2m is competing against 7p and 8s, not North. Thirdly, even if 3m is drawn after discarding 2m, it still improves the hand, so those 4 effective tiles are not totally lost.

2m also matters for safety. Completing a ryankan often requires discarding a dangerous tile because it is not known which tile will be left over. If the shape later completes yet cannot discard the extra tile due to danger, its wide acceptance was an illusion all along.

Two turns later, the robot's hand made no progress while the dealer discards two middle tiles in a row. Because of this, safety and speed have become more important compared to value. The robot **discards 8s** and keeps 4s, which is faster and safe against dealer.

One turn later, the dealer and opposite player both discarded from hand, the latter a middle tile. Either of them can riichi at any moment. It is practically impossible to outrun both players with a 4-shanten flush. Therefore, the robot **discards 7p**, a defensive liability that is no longer useful for its original purpose of hand value. This keeps as many safe tiles as possible, including West which arrived just in time, and doesn't lose much speed since it was a floating tile.

The dealer pons 7p and discards 8p, opening with a good shape. They can't be slower than 1-shanten and might be tenpai. The opposite player sees this and still discards 5m from hand. Time to fold.

With enough safe tiles, the robot **discards North**, saving 4s for the unlikely chance that after exhausting its honor safe tiles, 4s becomes the 5th block in an accidental tenpai. North is the most dangerous honor, and discarded first in case the safer ones are needed for a more dire situation later.

The dealer pons 3s and discards 9p. This reveals an enormous amount of information about their hand. They called pon on 7p from 7789p and kept 33s when breaking 334s in the early game. The dealer can only be tenpai, and their yaku can only be toitoi. The opposite player, seeing this, pushed a live terminal from hand.

Upon drawing a live yakuhai, the most dangerous tile against toitoi, there is no longer any point in trying to win this hand. The robot **discards 4s** and folds completely, as it passes dealer but might not pass the opposite player later.

Naga would discard 1p here, which would be a huge mistake even though it's outside dealer's early 3p discard. If dealer can cut 4s in the early game from 334s to keep 33s, they could also have cut 3p from 113p to keep 11p. The usual rule that tiles outside early discards are safer doesn't apply here.

LuckyJ avoid this pitfall and continues folding by **discarding red dragon**. Playing even safer with discarding 3p is unnecessary because the hand has enough other safe tiles. It might not even be safe since the opposite player could be damaten with how hard they're pushing. 3p also preserves an outside chance at making tenpai by accident.

Two turns later, the opposite player deals in after pushing a whopping 6 consecutive dangerous tiles.

Dealer mangan, 12,000 points. The robot escapes unscathed with two safe tiles to spare.

Closing

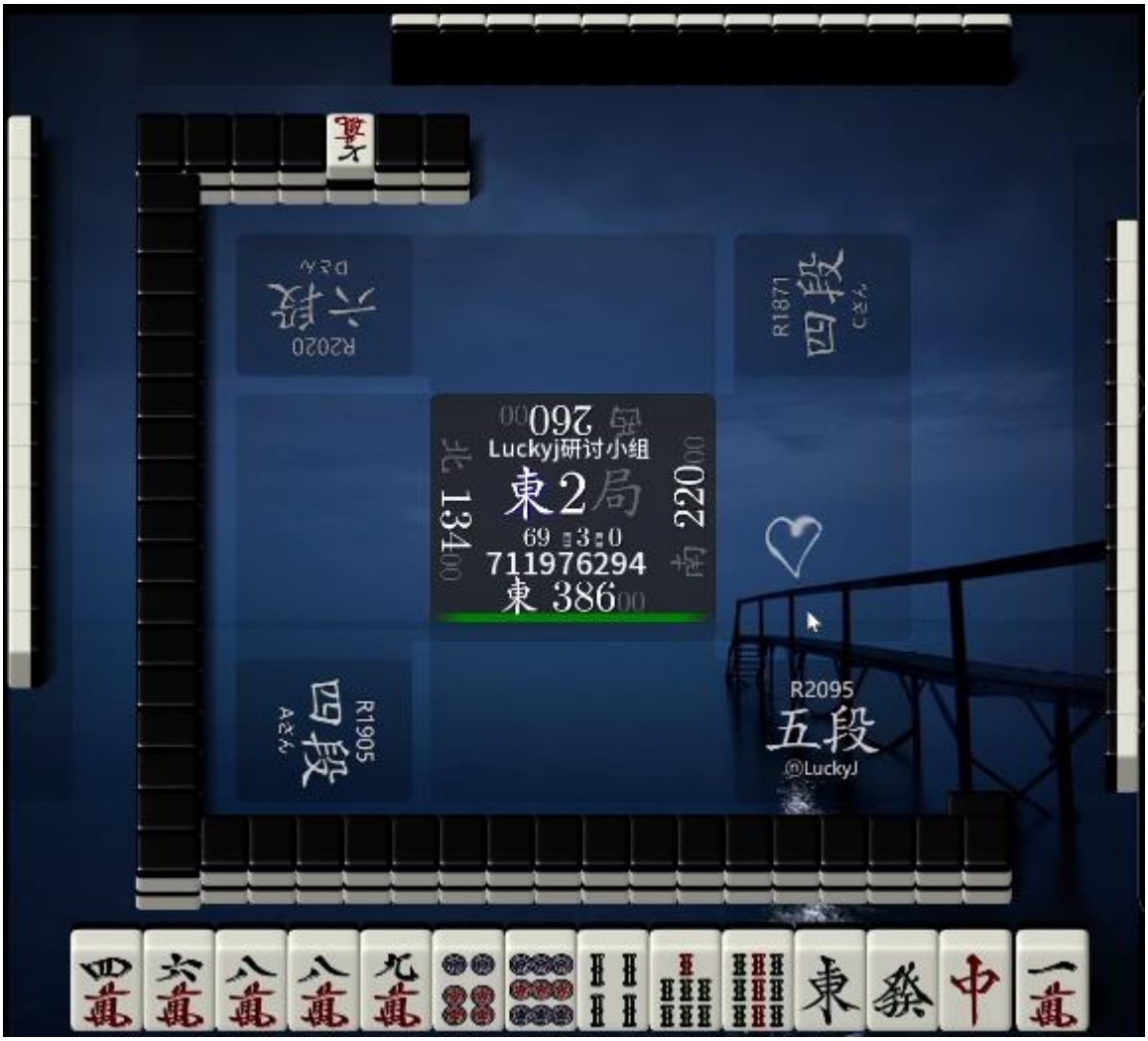
This hand shows how the worse a starting hand, the more carefully it must be played. Hands far from tenpai have enormous tile acceptances, and maximizing acceptance without considering other factors is almost never a good idea. All factors such as safety, speed, value, and opponents' progress must be considered to arrive at the correct play.

With an open hand, it is even more important to monitor opponents for signs of danger and play accordingly. The three factors of value, speed, and safety each vary in importance depending on how the others play. During this hand, the robot shifted its focus from balancing all three, to speed and safety when things got dicey, and finally to only safety as the situation became dire.

Reasoning like this allows advanced players, human and robot, to make dangerous-looking plays like the pon of white dragon without their deal-in rate going through the roof. Any chance to win a hand, even one as poor as this, cannot simply be ignored. Mahjong is not generous in how many winning chances it offers, so every chance must be pursued. The difficult but necessary part is doing so without leaving oneself defenseless.

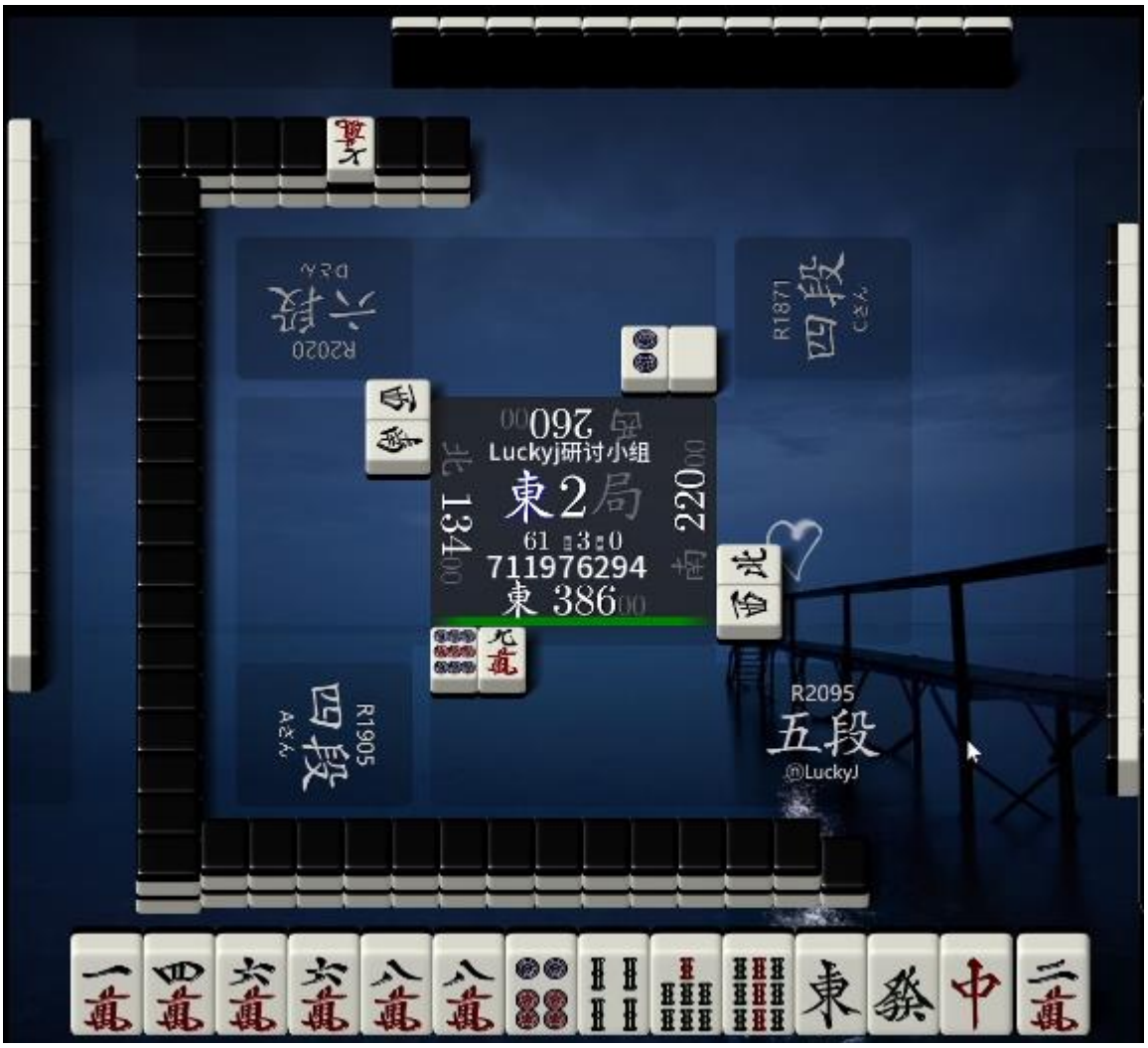
This hand also showcased some specific techniques like reading calls and discards to determine a player's likely hand, of recognizing shapes like ryankan as hidden risks, of evaluating speed beyond simply counting effective tiles, and of deciding which order to discard tiles while folding. Each of these techniques, as well as the general game plans discussed earlier, can be studied in more depth, and each can prove useful in your next game. There's always more to learn and apply.

Hand 4



The robot has pulled ahead early with an ongoing win streak. This changes how it should play compared to at flat scores. In particular, the value of winning a cheap hand is diminished. Push-fold judgment becomes more conservative, which also points to building expensively, because counterattacking requires a better hand than usual.

The robot's **first discard is 9p**, the most efficient discard. While the score situation points to building value, 789 sanshoku is far less likely than yakuhai and is not enough to sacrifice speed for.



On the second turn, the robot draws 6m and **discards 9m** as it is now redundant for accepting a second 7m and fixes dora.

On the third turn, the robot draws 2m. What to discard here?

Perhaps most people would discard 1m, an honor, or go for a flush with 6p or 4s. LuckyJ chooses none of the above, and **discards 9s** instead. Why?

Simply put, 9s is the only discard that doesn't lose any chances at making an open hand. This slow hand probably cannot win closed, and doesn't need to because with 2 dora, value from riichi is unnecessary. The three possible yaku this hand can open for are tanyao, yakuhai, and a flush. 9s is the only tile useless for all three.

The player across discards 9s from hand, pons Green Dragon, and discards 8s from hand. This means they are at least 2-shanten with good shape and most likely 1-shanten. Decisions from this point on can no longer be considered “early-game”.

Given the across player’s speed, it is no longer viable to pursue a flush with 4 odd-suited tiles. The robot abandons the flush and **discards 1m**, preserving the possibilities of tanyao, yakuhai, and a safe tile in Green Dragon.

The player across discards another middle tile from hand, and the robot draws the 5th block towards tanyao. Tanyao is now the hand's only winning plan because flush was abandoned last turn and waiting to pair a yakuhai is far too slow to catch up. Because of this, the robot **discards East** and does not get greedy for the possible 2-han from collecting 3 of them. The defensive value of Red Dragon is much more valuable here.

In the past few turns, the robot upgraded its Red Dragon to another 8s, which is both safe against the player across and effective towards tanyao. The player across called chii on a good shape and discarded Red Dragon, a saved safe tile. They could very well be in tenpai. A couple of useless and safe draws later, the robot draws an unsafe 9m.

It is important to note here that despite this hand being guaranteed mangan, its actual offensive value at this stage is nearly zero. It takes true desperation, not the situation here, to push a non-suji tile with a 3-shanten hand, no matter how valuable, against a probable tenpai. The robot **discards 8s**, preserving its blocks for tanyao and saving Green Dragon in case anyone else, like left-hand opponent who just discarded several middle tiles, also attacks later.

The player across calls chii on 5m and discards 3m. With three exposures, the last one with a complex good shape, hand-reading techniques can be applied to identify several highly dangerous suji against them: 36p (aidayonken), 69m (urasuji of 5m and includes dora), and 147m (improved from shanpon including 23334m or 33456m).

Given this information, the robot **discards 8s** to fold completely because this hand's chance of winning has truly become zero. 9m and 6p, both identified as highly dangerous, are impossible to get rid or make use of within so few remaining turns. The only priority now is safety, and 2p is saved for being marginally safer against the other two players than 8s.

Several turns of basic folding later, the robot runs out of guaranteed safe tiles and must now **discard 4s**, the safest remaining tile.

The player across deals into the riichi with the 4th dangerous tile they pushed against it.

3500 is about as cheap as it gets under these circumstances. Hats off to all players for a well-played hand.

Rewinding and revealing shows how well the hand-reading techniques worked in this instance. 9m really was dealing in, and the player across really did improve a shanpon including 3m with the 5m chii.

Closing

There are two main takeaways from this hand.

Firstly, in the early game without a clear direction, balancing progress towards multiple possibilities, even at the cost of pure efficiency, is often the best play. By leaving all options open, the best one will reveal itself in due time. This is called “combining your chances”, an important strategic concept in many games, including mahjong.

Secondly, especially with a slow hand, it is of utmost importance to observe what opponents do and act accordingly. Notice how quickly the robot’s game plan changed from balancing three yaku, to balancing two, to only tanyao, to playing safe tiles while preserving a winning shape, to folding completely, based on what its opponents did. Failing to observe the opponents for even one turn could mean missing one of these strategic transitions and making a mistake.

While hand-reading techniques worked perfectly on this hand, it must be said that they are not the focus of this episode, or indeed any episode in this series. The overall strategic vision on which direction to take the hand in what situation is far more important, and much more worthwhile to master.

Hand 5

The robot finds itself in second place at South 2, leading 3rd and 4th (dealer) by a mangan and trailing 1st by a little more. At this score, a mangan win is particularly valuable. At the same time, so long as it doesn't deal in, it's hard for the robot to end up in danger of finishing last. All this adds up to mean any win cheaper than mangan is not worth much, so low-value hands will be readily folded for safety. Conversely, if there is a way to reach mangan, a lot can be sacrificed for it.

This is a fast start, with 2-3 han of value from two pairs of yakuhai and dora. But 2-3 han is not mangan, and the robot's general game plan will be hunting that 4th han without falling behind in speed.

On the first turn, if you said 99% of humans would discard West, I wouldn't bet against you. But the robot defies expectation and **discards 5p**.

This is to maximize mangan chances. To keep 5 blocks, the discard candidates are 5p, 2s, and West. Out of these, 5p can only provide a 4th han by gaining red 5p. 2s helps by accepting 4s and being effective towards chiitoi, toitoi, and honitsu. West is a safe tile and effective towards toitoi and honitsu.

5p's only advantage over 2s and West is it has more chances to make a good shape, but the hand is not in much need of shape improvements. This is because value is a higher priority, there's only one bad shape to replace, and the bad shape's liability is diminished due to being able to open. 5p may be kept at a different score and round, but here, it is the least useful tile.

The robot is disappointed next turn when it drew red 5p, its only value concession from discarding 5p. It **discards West** because it's easier to score a han from using red 5p than to gain yaku with West.

The third turn, it faces a tough decision. What's the best play towards mangan?

The discards that maintain 5 blocks are 1m, 5m, 6m, red 5p, and 2s. Nothing else needs to be considered.

5m can be eliminated first because it is strictly worse than 1m in terms of shape improvements and the speed of floating tiles after completing the leftover shape (12366m vs 34566m with useful 36m floating tiles). Setting up a suji trap is not relevant when waiting on 2m kanchan doesn't gain value and is the hand's last resort.

Red 5p can be eliminated next because using it is worth a han.

The remaining discard candidates are 1m, 6m, and 2s. Recall that this hand has several routes to mangan: dora, honitsu, chiitoi, toitoi. Now examine each tile:

- 1m cannot accept dora, is not useful for honitsu, is an acceptable pair candidate for chiitoi, and probably won't be used for toitoi.
- 6m cannot accept dora, is not useful for honitsu, is a pair for chiitoi, and is a low-quality triplet candidate for toitoi.
- 2s can accept dora, is useful for honitsu, is a pair for chiitoi, and is a higher-quality triplet candidate for toitoi than 6m.

With these comparisons laid out, it is clear why the robot **discards 1m** here.

Breaking 13m appears to lose a block, but the hand still has 5 blocks because 35m and 66m can be seen as two blocks. The resulting hand can still open for anything, including a chii in sou that grows that suit into two blocks. Using shapes like 2234 and 3566 to change a hand's shape while maintaining 5 blocks is a common technique to pursue value.

Even if the broken 13m block is never replaced, the hand's worst-case scenario is ending up with a sticky iishanten with red 5p and 2s as floating tiles. This is still acceptable because sticky iishanten is not slow and the mangan goal would still be alive. Keeping 13m amounts to almost giving up on mangan, which is contrary to the hand's original goal.

The robot **calls pon** (of course) and **discards 3m**, continuing to hold out for value. This really does lose a block, but the robot accepts the possibility of growing souzu into two blocks and the sticky iishanten with red 5p and 2s as enough compensation.

If 4m is drawn, the hand is 1-shanten waiting to extend red 5p or 2s. This is still progress, so 4m's effectiveness is not totally lost.

Next turn, the hand takes its final shape by regaining its 5th block. The robot **discards red 5p** to lock it in. A 1-shanten that can open for anything, worth at least 3 han and most likely 4, with possible improvements of up to 6 han, is exactly what it wanted.

No more non-trivial decisions arise. The player across deals into left-hand opponent to end the hand.

Closing

This hand showcases an important truth: all strategy concepts, even ones as fundamental as tile efficiency, are only means to the end of improving placement. On any given round, depending on the score, the value of a winning hand is not linear with respect to its point value. Especially near the end of the game, the score situation can be such that hitting a score threshold is more important than trying to win the hand at all. If this means the correct play is disregarding efficiency and 5-block theory, so be it.

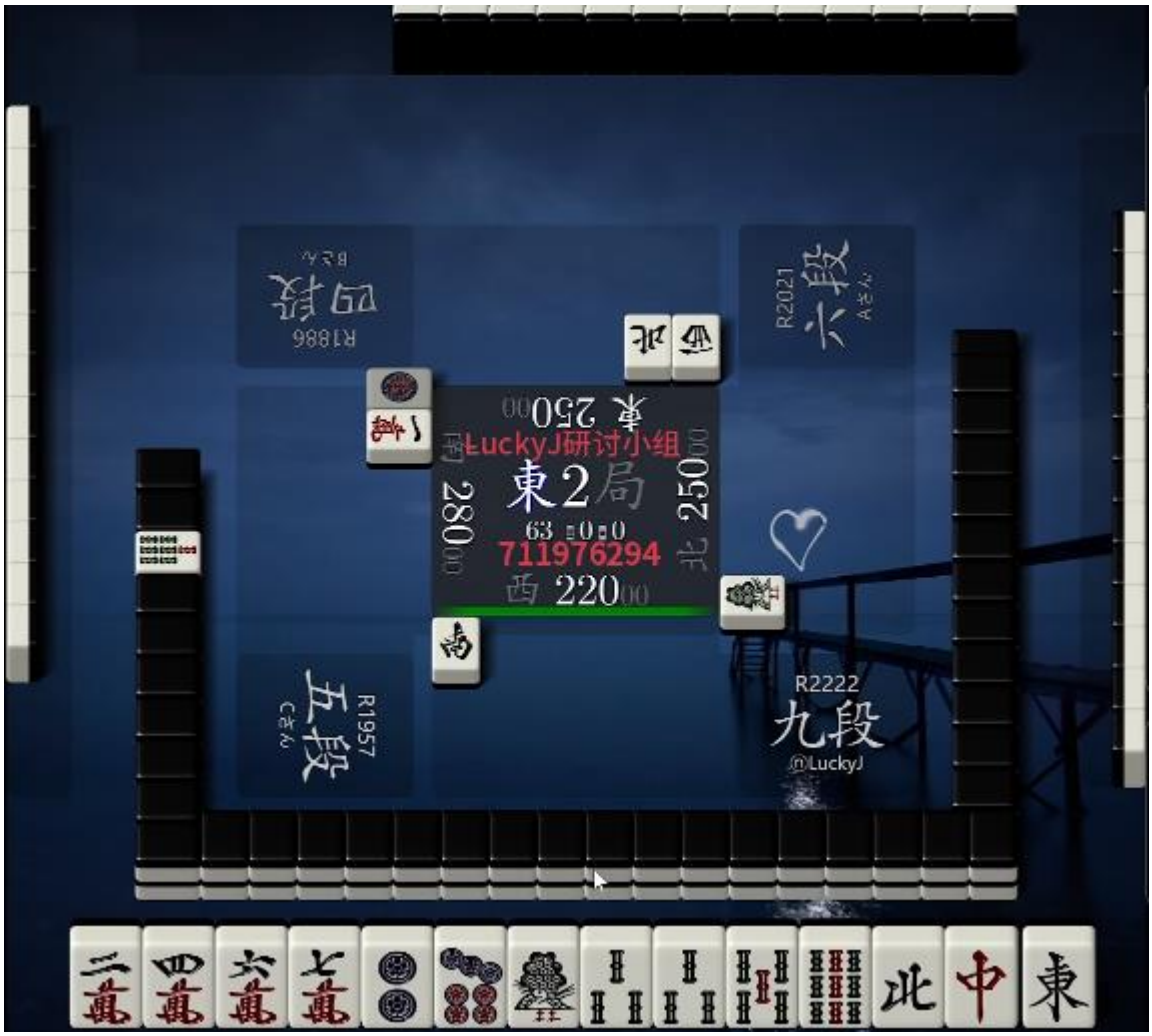
Note how the robot strategized for final hand value starting from turn 1. This is an important concept: the farther a hand is from tenpai, the more viable it is to sacrifice speed for value. This is because tile acceptance shrinks as a hand progresses, making each sacrificed effective tile more impactful. Since a hand is farthest from tenpai at the start, it makes sense to begin considering the trade-off between speed and value from the start. Do not

fall into the trap of pursuing only speed, only to realize upon reaching tenpai that there's now no way to achieve the desired value.

It cannot be stressed enough that early decisions are not trivial. Notice how many difficult decisions the robot made in this hand in the first row, and how its second row consisted only of discarding obviously useless tiles. In terms of strategy, Japanese Modern mahjong has several obvious, impactful types of binary decision built in, such as push or fold, open or closed, and riichi or dama. But it also has far more numerous, subtle, nuanced, and open-ended decisions that are at least comparably impactful in aggregate. It is mastering the latter type of decision that separates the excellent players from the merely good, and what gives the game so much strategic depth.

Hand 6

East 2, even scores. No adjustments are needed for the score and round. The robot's starting hand is about as bad as they come.



With a bad starting hand, the default plan should be a three-way balance between open tanyao, open yakuhai, and keeping safe tiles. The robot **discards 9s**, the least useful tile for all three plans.

Even though 9s can accept 8s, 89s is not compatible with tanyao, diminishing the benefit from keeping it. To score the dora, the robot would need to draw 8s, draw or chii 7s, pair East or Red Dragon, and pon or draw that pair into a triplet. The chances of all those things happening before an opponent manages to win is not enough to make up for the efficiency loss of keeping a lone terminal.

Since Red Dragon is now discarded once, it can serve double duty as both a safe tile and a yakuhai candidate. The robot **discards North** as it is only a safe tile and thus inferior to Red Dragon. It doesn't need to keep both safe tiles this early when opponents have only discarded terminals and honors.

In any hand that is likely to play from behind, floating tiles cannot be ranked by efficiency alone. The best floating tiles in a bad hand are those that contribute to efficiency yet can be safely discarded later. In this hand, those are East and Red Dragon. The robot **discards 2p** because it is the least efficient floating tile after those.

The reasoning behind the previous discard still applies one turn later, when the robot draws yet another yakuhai with one copy visible. It **discards 1s**, which is inferior to 7p because it is useless for tanyao.

Since 8s is dora, 68s can be considered a block. This means the hand just gained a block and faces the choice between discarding East for more speed or continuing to balance offense and defense by discarding 7p.

Most humans would discard East here, trusting two safe tiles to be enough and pursuing speed. However, the robot **discards 7p**. It believes a 4-shanten hand at the end of row 1 is virtually impossible to win. Even a second row tenpai is unlikely. Therefore, it focuses almost solely on defense, with offense only an afterthought. 7p is a dangerous floating tile, the honors are safe floating tiles, so 7p must go. If one of the yakuhai were missing from the pond, that would be the discard instead as it would not be safe.

The slim chance of sanshoku is not relevant because sanshoku only counts if the hand is won, a negligible possibility at this point.

The robot **discards East** as it is now the most dangerous floating tile.

As expected, the robot now faces a riichi. It is well-prepared to defend with three genbutsu and three visible honors. The fact that the riichi was tsumogiri is irrelevant because the plan was to fully fold to any riichi.

Imagine what the hand would look like if the robot discarded for pure efficiency. It would be without West and Green Dragon but with 57p, 3-shanten and nowhere close to competing against riichi. Even if no safe tiles were kept and Red Dragon was 9s instead, it is still 2-shanten with bad shapes and must be broken apart to defend, without the benefit of additional safe tiles in the honors.

The rest of the hand consists of basic folding according to the safety chart and is omitted.

Closing

This hand demonstrates an important strategic concept: the worst possible situation is being behind in speed yet forced to either push or defend with marginal safe tiles due to lacking defensive assets. It is the number one reason for poor results among skilled players and must be avoided if possible. The best way to avoid this situation is to recognize when a hand is likely to be behind and prepare to face a riichi by saving safe tiles. The worse the hand, the more valuable defensive assets become. This hand is about as bad as it gets, and the robot's extreme aversion to keeping dangerous floating tiles reflects this strategic principle.

One common technique to achieve such safety is combining chances between tanyao, yakuhai, and safety. Another technique is to keep floating tiles that provide both speed and safety over those that only provide one. Often, evaluating discards from both perspectives will lead to the correct choice in a bad hand. Both are showcased extensively here. In fact, these techniques can be applied on most hands, though perhaps not to this extent. Learning when and how to use them will help take your game to the next level.

Hand 7

The robot is in last place, far behind 3rd in South 1. In this situation, folding is irrelevant except as a last resort, and ending the hand without getting any closer to 3rd would be a bad outcome. This means the usual strategy for playing a bad hand, a three-way balance between open tanyao, open yakuhai, and hoarding safe tiles, is no longer optimal. This hand must be played towards a win, preferably a valuable win, until winning chances become obviously negligible.

It should be noted that an open tanyao or open yakuhai 1000-point win here will consume a remaining round without significantly impacting the score, making them unappealing targets. Thus, the robot **discards White Dragon** before North. Discarding shared yakuhai early minimizes the chances they'll be claimed via pon, slowing down the hand's overall speed for all players. This reasoning doesn't apply to North, which is not a shared yakuhai, and North is an emergency safe tile on top of that.

No obvious path to a valuable hand exists. The robot **discards 9m** to balance tanyao and keeping safe tiles. The safe tiles aren't to fold, but to enable pushing by being safe discards when behind. The discard is 9m instead of 1s because 1s is safe against the player across, the main competition, so it is less of a defensive liability.

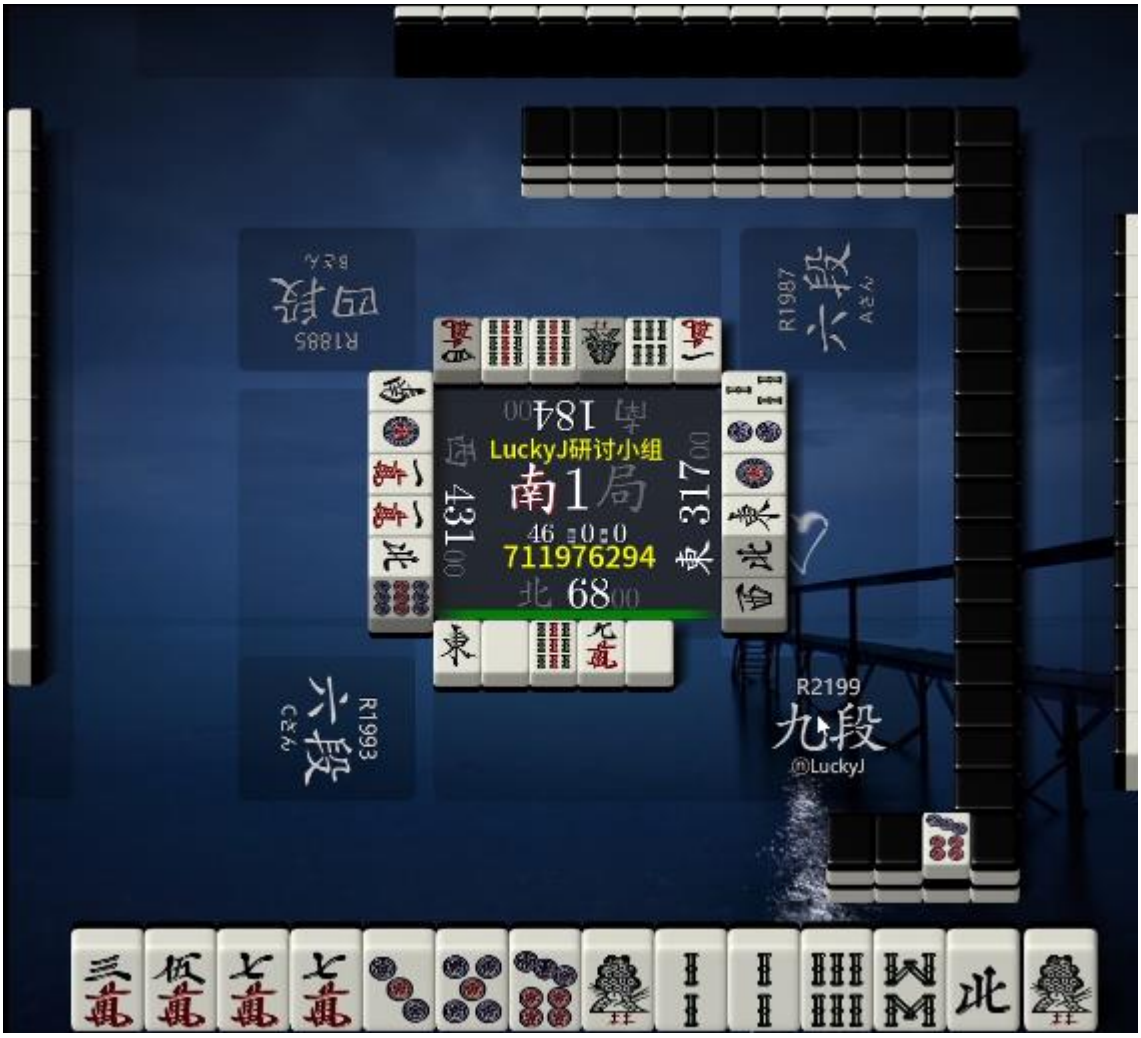
3p is good enough of a draw that keeping two safe tiles is no longer necessary. The robot **discards White Dragon**. There are some subtle reasons why the robot discarded an effective tile last turn, but a safe tile this turn.

First, while this hand is strong enough to play with only 1 safe tile given the score and round, it is not strong enough to play with none. This means if White Dragon was discarded the previous turn, gaining any effective tile except 8m makes 9m the next discard. On top of that, even if 8m is drawn after dropping 9m, it still improves the hand, so 8m is not a total efficiency loss. Overall, this means 9m's contribution to efficiency is slim, transient, and dispensable.

Second, 9m is a bigger defensive liability than 1s because 1s is safe against the main competition, the player across.

Third, the hand has two heads. Last turn, both heads were part of compound shapes, meaning if one head becomes a limb, the compound shape on the other head becomes

redundant. That makes the two compound shapes somewhat redundant with one another since completing a limb creates two floating tiles instead of one. That no longer applies this turn, with only one compound shape among the two heads.



Many people would discard North here, but this kind of play often makes a bad situation worse. It's South 1, not South 4, and this hand is approaching the second row, 3-shanten, with no other safe tiles against left- or right-hand opponent. North must be kept for safety.

It is also important to consider chiitoi. Any hand with more than 2 pairs and all bad shapes is a chiitoi candidate. In this case, chiitoi is the hand's best hope for mangan and as important as the regular shape. This means all pairs need to be kept too.

By process of elimination, the robot **discards 3m**. Since 1122s must be kept, it is two blocks, meaning the hand has six blocks. Slimming 3577m, two weak blocks, into one compound block is better than weakening a different block.

Next turn, the robot faces another tough decision. North and all pairs should be kept for safety and chiitoi. 8p is dora and of course must also be kept. This leaves preciously few options for the next discard, all of which incur efficiency hits.

8p made 3578p into two blocks, so the hand again has six. Unlike the previous turn, there is no option to slim two weak blocks into one compound block. The robot **discards 5m** because gaining 6m towards a regular hand weakens the chiitoi option, making 6m worse than the hand's other effective tiles, and least costly to part with.

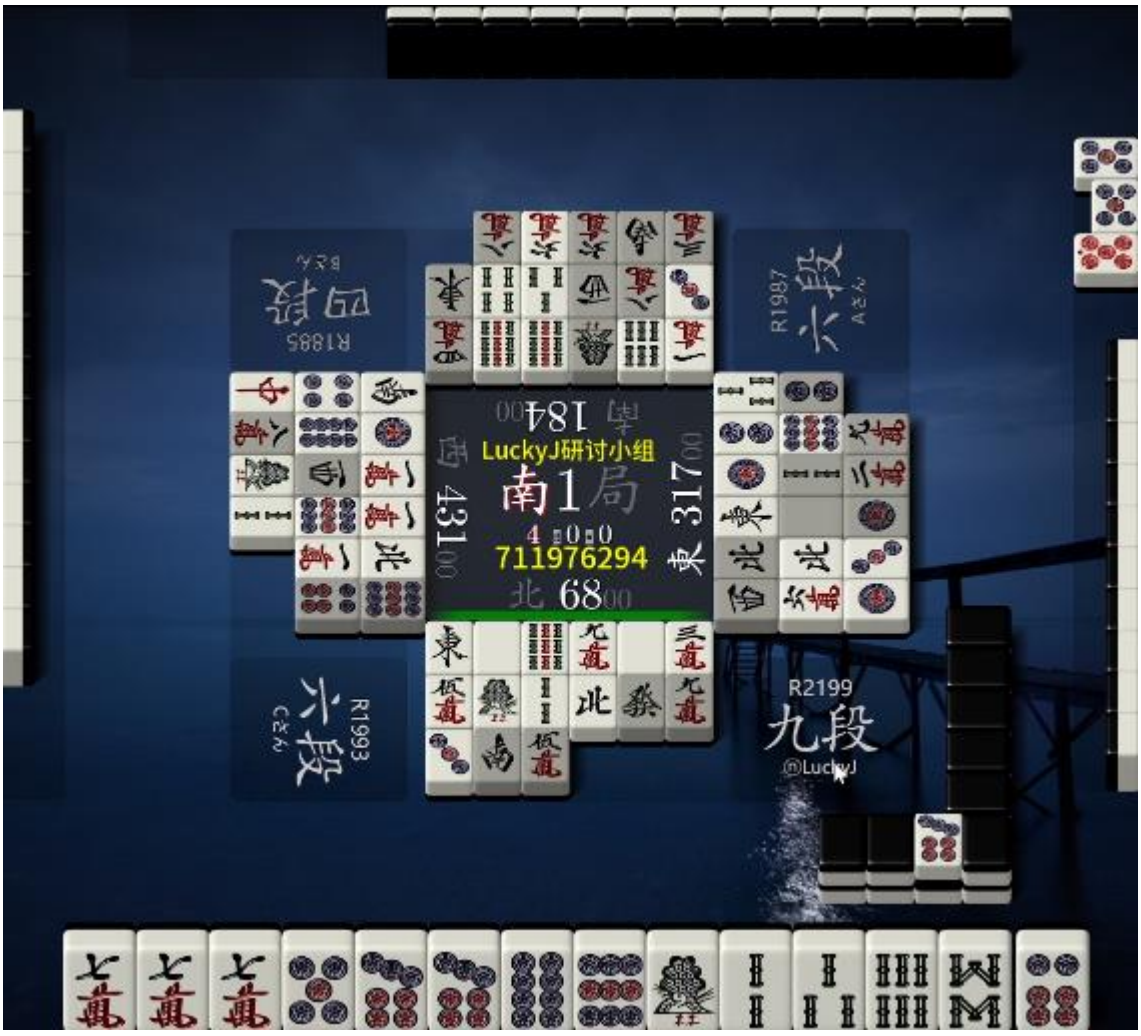
The 7m draw tilts the balance between chiitoi and tanyao towards tanyao. Since the hand now contains too many useful tiles, it is no longer possible to balance between chiitoi, safety, and a regular winning shape. The robot abandons chiitoi and **discards 1s**.

7p makes the hand 1-shanten. Even though the 1-shanten is only for a bad-shape, no-value hand that requires discarding dora, at this score and round, this is still strong enough to play without a safe tile. The robot **discards North**.

With a late pon of 5p and discarding 3p the previous turn, the dealer is probably tenpai. This late, it is important to not only watch the dealer's discards but also whether the other players are pushing or folding.

Notably, a bit earlier, the player across dropped 34s from hand, so they are highly likely to be at least good shape 1-shanten.

3p is the obvious discard here, being both safe against dealer and the most efficient option anyway.



The robot takes tenpai by **discarding 7m**, the safest option against dealer. Both souzu are highly dangerous given the lack of high souzu in dealer's pond, while 7m is one-chance and outside dealer's 6m discard. Of course, this also happens to wait on the most tiles, but the main reason for the decision is safety.

No last-tile miracle this time. The robot **discards South** and ends the round in tenpai.

As it turns out, the player across either never reached tenpai or took apart their hand to defend towards the end. The robot catches up by 4000 points without consuming a round, an excellent result given its starting hand.

Closing

The middle stage of this hand is another case of combining chances. This time, the chances are between chiitoi and a regular shaped hand. Importantly, single live yakuhai was not kept in the early game as the score and round made it unappealing. This allowed the hand to hold enough tiles to pursue a closed hand with reasonable efficiency. Both chances were kept viable for as long as possible, and the robot only committed to a regular shape when it was no longer possible to advance both. Three strategic points, all shown here, are important in combining chances: choosing what chances to pursue, keeping all chances open whenever possible, and knowing when to commit to one direction when the choice becomes clear.

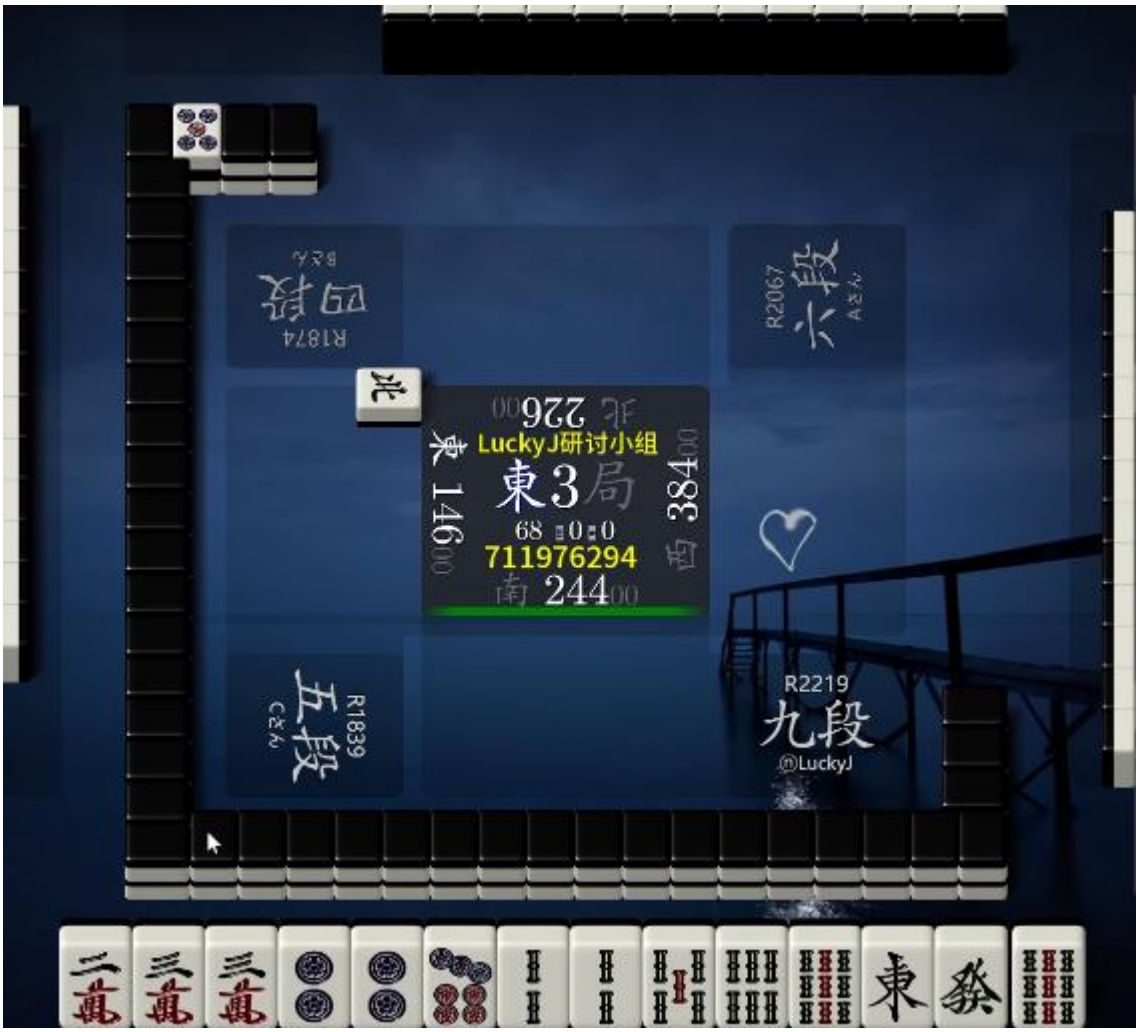
Another important strategic concept in this hand is adjusting play to the score and round. Ordinarily, such a bad starting hand would have kept its safe yakuhai and discarded its terminals, for the classic 3-way balance between tanyao, yakuhai, and safety, then folded at the first sign of danger. But that strategy would have been detrimental here because it would have resulted in a small win at best and moderate loss at worst. The robot rejected this game plan and chose a more optimistic, riskier route as the situation called for.

Even in this dire score situation, the robot kept a safe tile until 1-shanten. As much as being behind calls for being aggressive, it is usually unwise to abandon defense entirely with a slow hand. Defensive assets aren't only useful for folding, but also for passing at least an ippatsu turn to enable continued pushing when behind in speed.

Finally, although the robot pushed some unsafe tiles towards the end to achieve tenpai at draw, it didn't push any highly dangerous ones, at most risking one-chance. It would have been unwise to push dangerous non-suji tiles, even at this score, for a mere tenpai at draw. Being behind calls for aggression, but it does not call for abandoning reason or discounting the possibility of a loss. Maintaining a calm, logical approach to the game, in any score situation, is one key to avoiding fatal blunders that plague the intermediate player's logs.

Hand 8

East 3, second place. Even though there are big score differences to both first and last places, and even though last place is also dealer, East 3 is too early for this score situation to significantly affect strategy.



Despite the hand having four pairs, chiitoi is not a major factor in deciding what to play. A regular hand that started with five blocks and two good shapes is much faster than a 2-away chiitoi. Even considering chiitoi, the usual rule that honors and edge tiles are easier to draw for chiitoi doesn't apply on the very first turn because nobody had time to collect middle tiles yet.

The robot **discards Green Dragon**. Strictly speaking, East is the better discard, but the robot sometimes randomizes its play to be less predictable. If it always discarded East here, people would know it never has an East when it discards a dragon first and can possibly exploit that information.

The hand gains a sixth block. Compared to tanyao with all good shapes, chiitoi is so slow as to be irrelevant. The robot **discards 9s** to break its worst block.

The robot **discards the other 9s** to keep Red Dragon which is superior in both value and safety. Next turn, it draws another Red Dragon to gain a sixth block again.

The most efficient play, and Naga's choice, is 2p, breaking the hand's worst block that only provides one effective tile. However, with three 1s visible, LuckyJ **discards 3s** and plays with six blocks. This only loses one immediate effective tile and preserves the higher-value possibilities of tanyao and chiitoi at the cost of some speed.

Notably, 3s was only viable as a discard choice when both effective tiles it gave, 1s and 4s, were made less relevant by being seen 3 times or by being already accepted by another block. If either of these things weren't true, discarding 2p would clearly be better.

The next turn, the robot faces another choice between five or six blocks when 3p gave the hand a chance at pinfu. 2s, discarding the worst block, is the most efficient play, and Naga's choice again. However, it foregoes tanyao and pifu, limiting the hand's value to 2-han open or 3-han riichi. Red Dragon, for the fastest open hand, is another possibility, but this is even worse for value as neither tanyao nor pinfu is guaranteed.

LuckyJ **discards 2p**, again choosing six blocks. This maximizes the chances of the hand scoring one of tanyao, pinfu, and yakuhai, foregoing the slow and barely relevant chiitoi. Another factor in this decision is the round is nearing mid-game, where keeping six blocks has the additional advantage of flexibility, being able to discard any block for defense without folding completely.

Drawing 2s means pinfu is no longer possible. The hand has too many good shapes, so the most efficient discard is breaking one with 3p and 5s. The advantage to breaking 23p or 56s is the extra, albeit low-value, acceptance of 14m, as well as reaching perfect 1-away including a pair of dragons on the next effective draw. However, LuckyJ rejects this and **discards 2m**, playing with six blocks again.

It did so for three reasons. Firstly, this hand has all good shapes and can afford to give up some speed for value. Secondly, the reasoning for keeping six blocks on the previous turn, flexibility in defense, still applies here. Thirdly, although breaking 233m gives up on perfect 1-away, the hand's final wait can still only be good shape, at minimum shanpon including honors. These concessions are acceptable in pursuing an extra han via tanyao or yakuhai.

With all good shapes and being able to open, the robot **calls kan** to increase its hand value. One more dora would make the hand 3900 ron, 5200 tsumo at minimum, and is worth the risk.

The kan does indeed gain a dora, so it is no longer necessary to sacrifice speed for value. The robot **discards 3m**, its worst block, trying for a quick win.

Drawing another dora next turn raises the hand to mangan if all dora are scored. Even though 34m is furiten, LuckyJ still thinks the extra value is worth reverting to six blocks, and **discards 7p** to lock in the dora pair. In contrast, Naga discards 4m here for maximum efficiency, deciding that the speed gain from accepting 58p is worth the lost value, as the hand is already valuable enough.

After cutting 7p, the hand can open for all its effective tiles towards mangan, though it probably wouldn't chii 1p too early. The resulting hand, unless atozuke on Red Dragon, will be good shape and high value, and has the option to break a block for defense without folding entirely.

The robot **discards Red Dragon** to lock in its final shape, a double two-sided 1-away mangan that can open for all its effective tiles.

The robot eventually reaches tenpai by calling chii on 4s and discarding the third Red Dragon. Here, it **discards 3m** to get out of furiten as there is only one 2m left.

Although White Dragon is unseen so late and therefore highly dangerous, with so many dora visible, it's still worth pushing for mangan and tenpai at draw. The robot **discards White Dragon**.

The hand ends with White Dragon dealing in for 2600.

Closing

Whether to play with five or six blocks has been debated without a definitive conclusion for as long as mahjong strategy existed, and this hand is an excellent example of how to choose between them. In modern Japanese mahjong with red fives, efficiency, especially 1-away efficiency, is king, making five blocks the default strategy. Keeping six blocks affords greater flexibility in choosing blocks for yaku or safety but leaves little room for safe tiles or floating tiles to improve shape.

Therefore, six-block strategy is more viable when the hand can open but doesn't yet know for which yaku, when the blocks contain defensive assets, when the hand has little need to improve bad shapes, and when chiitoi is viable. Examining the spots where LuckyJ chose six blocks on this hand shows how these principles guided its choices. When it gave up efficiency, the robot gave up tiles that are likely to result in low-value hands in favor of fewer, but higher-value effective tiles.

More generally, six-block strategy is also a case of combining chances, the combined chances being which five blocks to end up with. Delaying the choice allows for less regret when which five blocks to keep becomes clearer later. It also reflects the strategic concept of balancing speed, value, and safety. Although speed is the most important of the three, sometimes it makes sense to sacrifice some speed for either safety or value.

A side note here is despite its name, "perfect" 1-away should not be considered an important goal. It is a good shape, but there are many other good 1-away shapes, some of which are better than "perfect". Giving up perfect 1-away is commonly correct with enough compensation.

Finally, sometimes in mahjong, the correct decision is not clear. Expert human players will likely disagree with each other at various points during this hand just like LuckyJ and Naga did. It's more important to remember what makes six-block strategy more viable, how to combine chances, and how to balance speed, value, and safety. At higher levels, it is more important to adhere to consistent, logically justifiable overall strategies than to intensely scrutinize any individual play for one final answer.

Hand 9

South 2, second place, with about a mangan difference to both first and third. In this situation, a mangan swing in either direction is particularly impactful. Consequently, speed will take a back seat to value and safety now compared to in most score situations.

The hand gains its fourth block. Since the hand is slow, South will almost always appear in the final shape as a triplet (including shanpon waiting on South) for both speed and value, so the hand currently lacks a head.

Normally, middle tiles are better than edge tiles for speed, but this difference is diminished when the hand lacks a head because edge tiles are better at forming heads. At the same time, this hand has two routes to mangan, pairing East and/or the barely reachable manzu flush with five odd-suited tiles.

Both these factors combined makes the robot **discard 2s** over an honor. Of course, discards like this always concede some speed up front that should not be ignored. The two mentioned reasons don't automatically make keeping honors correct, and the final discard decision depends on an overall evaluation of the position.

The robot **pons and discards 6s**, sacrificing significant speed for value and safety.

This play is consistent with the previous one where the robot rejected effective tiles that led to mostly low-value, low-safety hands. Without adopting this overall strategy, Naga also pons here but discards an honor, and so it has lower preference for pon.

The previous discard of 2s, this pon, and the discard of 6s, are great examples of how strategic principles inform individual decisions. These three consecutive plays are all part of a strategy of treating value and safety as much more important than usual due to the score and round.

Dealer's pon drastically changed this hand's plans. With an early dragon pon and discarding middle tiles from turn 1, the dealer either has a quick hand or an expensive flush.

If the dealer has a quick hand, the robot should prioritize speed and keep a middle floating tile. If the dealer has a flush, then live yakuhai are dangerous and should be discarded before they deal in. Both factors point to keeping 7p instead of discarding it using the reasoning from previous turns. The robot **discards White Dragon**.

Dealer and right-hand opponent both pon dragons and discard middle tiles. Left-hand opponent also discards consecutive middle tiles from hand. Compared to them, the robot's hand is still 3-away with only one good shape. The robot is without doubt playing from behind.

East cannot be discarded, ever, from this point on. Without East, even the luckiest draws only result in a 1000-point hand, not worth trying for given the score, round, and everyone else's speed. Since pursuing pure efficiency requires discarding East, pure efficiency is no longer a viable strategy.

Since East must be kept, it counts as a block, so the hand has five. Unlike last turn, 7p forming another block would make a sixth, a more marginal improvement than the fifth. The robot **discards 7p** while it is still safe.

Right-hand opponent discards a joint inside-out, which indicates that they're highly likely to be 1-away at worst. Dealer and left-hand opponent both cut middle tiles, probably no worse than good shape 2-away.

The robot wants to get rid of Green Dragon, a defensive liability that doesn't contribute much to efficiency, but it's already too late to do so. It could deal in right now. Instead, the robot keeps it and **discards West**, a safer tile, while keeping North for later.

Left-hand opponent calls pon, likely advancing to 1-away or even tenpai. With all three opponents around 1-away, the deal-in risk is comparable to the risk against one riichi. A 3-away hand containing defensive liabilities has little hope of winning and should play as safely as possible. For this reason, the robot **discards 2p** over 9p or Green Dragon, leaving the unlikely flush as a winning chance in case it gets very lucky.

Since there is no realistic path to solving the defensive liabilities in Green Dragon and 9p, the robot **declines to chii** 7m even though it would only cost unsafe tiles.

Although 8s is one-chance, 7s being dealer's last discard from hand makes it unsafe because dealer could have reduced 677s to 67s as their final shape. The robot **discards North** to fold completely.

3p would have been the better discard, but it's unclear whether this robot knows 3p is still safe against dealer when left-hand opponent's pon skipped their turn.

Left-hand opponent breaks 6678m to pon 6m, meaning they're certainly tenpai for toitoi. All live tiles, especially East, are risky. The robot **discards 8m**, a temporary safe tile. Note how declining to chii 7m made 8m available now.

After several turns of the robot simply discarding its safest tile, dealer deals into left-hand opponent to end the round.

Live tiles were indeed dangerous against toitoi.

Closing

This hand illustrates how general strategic concepts tangibly affect decision-making and how strategies can change throughout a hand. The robot first prioritized value and safety based on the score and round. It switched to pursuing speed, then to balancing value and safety, then saving safe tiles, then using those safe tiles to defend, all within four turns. This does not mean its earlier plays were wrong or wasted effort. Instead, it shows how rapidly the best strategy can change especially during the midgame, and how important it is to reevaluate the overall situation constantly to make the best play each turn.

The way the robot played this midgame, especially after all three opponents opened, is worth studying in detail for how to play when multiple opponents may be close to or are in tenpai. Ideally, one should enter this stage of the game without carrying tiles that contribute to neither good offensive shape nor are safe defensive discards. This is not always possible, even with careful planning and play, as this hand showed. The robot was aware of how much these liability tiles hindered its ability to counterattack and did not hesitate to break its hand to defend.

Situational awareness, or adjusting strategies based on what the opponents are doing, is one of the most important concepts in advanced mahjong strategy. A lot of strategies logically follow from knowing approximately how far ahead or behind one is in the race. For those looking to improve past intermediate level, this is a good place to start. It opens whole new worlds of strategy beyond efficiency and defense, and these new strategies make mahjong, at least to some people, the deep, engaging game it is.

Hand 10

East 4, 3rd place. No strategy adjustments are needed for score and round. The robot started with two good shapes, two honor pairs including yakuhai, and one dora, a well above-average starting hand.

The first decision is whether to pon. At first glance, pon here would cost two safe tiles and constrain the hand to atozuke White Dragon for only 2000 points when such a good starting hand can aim for riichi worth much more. Not only that, calling pon on both West and White Dragon means 44s is the hand's head, and 344s is no longer a good shape.

However, White Dragon is the key to winning this hand regardless of what is done here. There is no foreseeable scenario where it will refuse to pon White Dragon. This means whether this hand is opened here or not, its final value will be 2000 points most of the time. If it gets White Dragon, it has no problem also opening for West. If it never gets White Dragon, then that becomes the hand's head, and it would need to either draw the last West or discard both Wests without opening for riichi dora 1.

Fully understanding this situation requires seeing the possibility of a flush. A flush in manzu, while unlikely, gives a boost to both above scenarios. If the hand gains White

Dragon, a flush raises its value to mangan. If it never gains White Dragon, a flush gives it a way to win open, without needing to draw the last West or discard the West pair.

This hand seems too far from a flush, needing to discard so many off-suit tiles including the good 344s shape. But recall that 344s in this hand will sometimes be the head. In other words, the shape's 25s acceptance lacks its full effect because the hand will sometimes discard 3s before it can gain them. This, combined with a flush possibility helping the hand both when it does and doesn't gain White Dragon, is what makes the robot **pon and discard 3p**. Now, instead of the original 2000-point projection, the hand will gain White Dragon for 2 han, become a flush for 3 han, or do both for mangan.

A small detail is the difference between 3p and 6p. The reason is red five acceptance. If the hand kept 3p and later drew red 5p, it would be awkward to decide between keeping it or continuing towards flush. But if it keeps 6p instead, rejecting the flush would be obvious.

Consistent with its previous move, the robot **discards 6p** here to continue pursuing a flush.

Normally, discarding middle tiles over honors is a huge efficiency loss. But the efficiency difference between middle tiles and edge or honor tiles diminishes the more a hand needs a head.

While this hand appears to have two heads, the reality is White Dragon will likely become a triplet and 344s will likely become a sequence. Both heads are unstable at best and not heads at all at worst. So, this hand has some need for another head after all. It is this effect, where a hand's demand for a head increases its tendency to keep edge tiles and honors, that enabled the robot to make the last two discards.

Next turn, the robot inches closer to a flush. The most efficient discard to balance both a flush and a White Dragon-only hand is 3s, fixing the head. But the robot **discards 4s** instead.

This is because at this point, after consecutive flush draws, a flush is now the hand's main direction. If an off-suit effective tile isn't strong enough for the hand to reject a flush, it is not effective at all. Discarding 3s gives the hand only 4s to reject the flush, while discarding 4s gives it 2s and 5s.

Since the hand still doesn't have enough blocks for flush, the robot **discards South**, which keeps the possibility of a non-flush hand open at the cost of its safe tile.

The robot gains another block for flush. Since White Dragon will likely be a triplet, the hand currently lacks a head, meaning the hand now has one more non-head block than it needs. It is obvious which one should be cut. The robot **discards 4s** and commits to a flush.

Of course, the robot **calls pon and discards 3s** here, advancing towards the win.

Next turn, the hand reaches good shape mangan tenpai. The robot **discards East**.

Good shape mangan tenpai is strong enough to fully push against riichi. The robot **discards Green Dragon** and pushes every tile afterwards, no matter how dangerous.

The hand ends in a win for 7700.

Closing

Strategy discussion aside, this hand shows some of the irony in studying mahjong. To the untrained eye, and even some trained eyes, LuckyJ didn't play this hand like a "stable 10d robot that's better than 9999 mahjong players out of 10000", but more like a beginner who just learned what flushes are and indiscriminately breaks good shapes in other suits to go for them. With the provided reasoning, its plays make more sense and can be learned from. But even with all its superhuman skill, the robot played no better than some beginners would have. This shows, above all, that mahjong is a game of chance. The player's agency is greatly constrained by the few true choices they're offered, so the choices of different levels of players will inevitably coincide from time to time.

It is not the choices themselves, but the reasoning behind them, that make for the best study material. The most important lesson to learn from this hand is looking ahead to see how a hand shape will likely develop. It is not enough to account for acceptance, efficiency, and shape for only the current turn. The expert player visualizes how the hand will evolve on future turns, what final shapes it can reach for what value, which tiles it can cut to defend, and more, to inform their present decision. This is why high-level players' logs are filled with times where they seem to know what will happen three turns in advance. In some sense, by applying this skill of looking ahead, they did.

There are three specific points of strategy to learn from this hand:

Firstly, riichi is not the only way a good hand can pursue value. Sometimes, as is the case here, an expensive open hand is more achievable.

Secondly, not every hand with good shapes can win quickly closed. The overall speed of a hand depends more on its slowest, not fastest, blocks. The robot correctly assessed that its honor pairs would bottleneck the hand if it remained closed and thus opened very early.

Finally, the value of floating tiles can change depending on how badly the hand needs a head. Needing a head makes middle tiles worse and edge tiles better. This alone usually isn't enough to discard a 3 over a wind, but other factors can influence the decision enough to reverse the importance of those tiles.

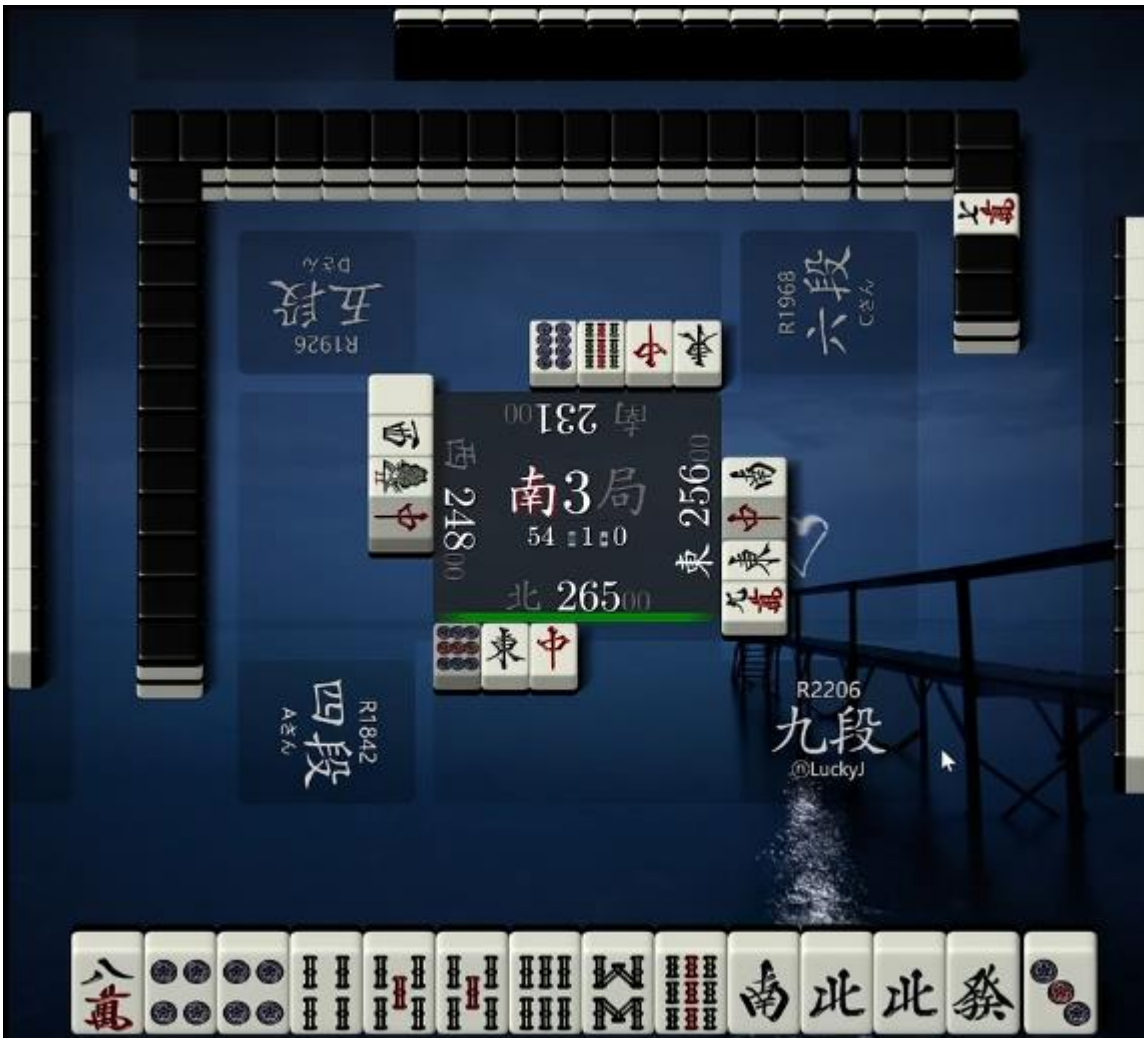
While the robot got very lucky to reach its ideal shape so early and eventually win, it made a series of decisions to have the chance at all. The adage "preparation meets opportunity" comes to mind. The intermediate sees the expert get lucky more than their fair share, but the expert knows what's really going on.

Hand 11

The robot finds itself in South 3 with the slimmest of leads. In this situation, speed is of paramount importance, tenpai at draw is worth no less than a win, and dealing in is almost never a justifiable risk.

Holding safe tiles becomes far more viable here, both to avoid dealing in and to safely pursue tenpai at draw in the late game.

It is also more important than usual in this situation to be aware of each opponent's speed. The optimal play will depend far more than usual on how fast the hand is compared to each opponent's.



After discarding a few useless terminals and honors, the robot faces its first real tough decision of the round.

Although this hand has two pairs, the 4p pair is part of a good shape. The North pair is yakuhai and will most likely become a triplet. Despite appearances, this hand lacks a stable head, and that makes it more viable to keep edge tiles and honors over middle floating tiles. This is one reason the robot **discards 5s** here.

But it cannot be the only reason. The bulging shape is one of the best shapes to hold when a hand is far from ready, and discarding it is an enormous efficiency loss. There are several other reasons why the robot discarded 5s here over 8m, 4p, 89s, South, or Green Dragon.

Firstly, 89s already accepts 7s, meaning the 4556s shape is worse at growing than it seems. Compared to 456s alone, gaining 7s makes no difference because 89s already accepts it. Gaining 3s or 6s forms a sequence plus 5689s, a severely weakened shape that barely qualifies as three blocks in the suit. This means that out of the usual four effective gains to

4556s, 3467s, only 4s is truly effective at making another strong block. This decreases the efficiency of 5s to around that of an ordinary floating tile, making 5s worse to keep than 8m since 8m is dora.

Secondly, suppose Green Dragon is discarded here instead, and consider how the hand could gain its next effective tile. If it draws one of 6789m13p, chiis 7s, or pons North, 5s would be its next discard to keep South as a safe tile. If it draws one of 245p7sN, it's a close decision between discarding 5s or South. 5s is clearly not the next discard only if the next effective draw is exactly one of 3456s. In other words, even if 5s is kept here, it will most likely become the next discard anyway.

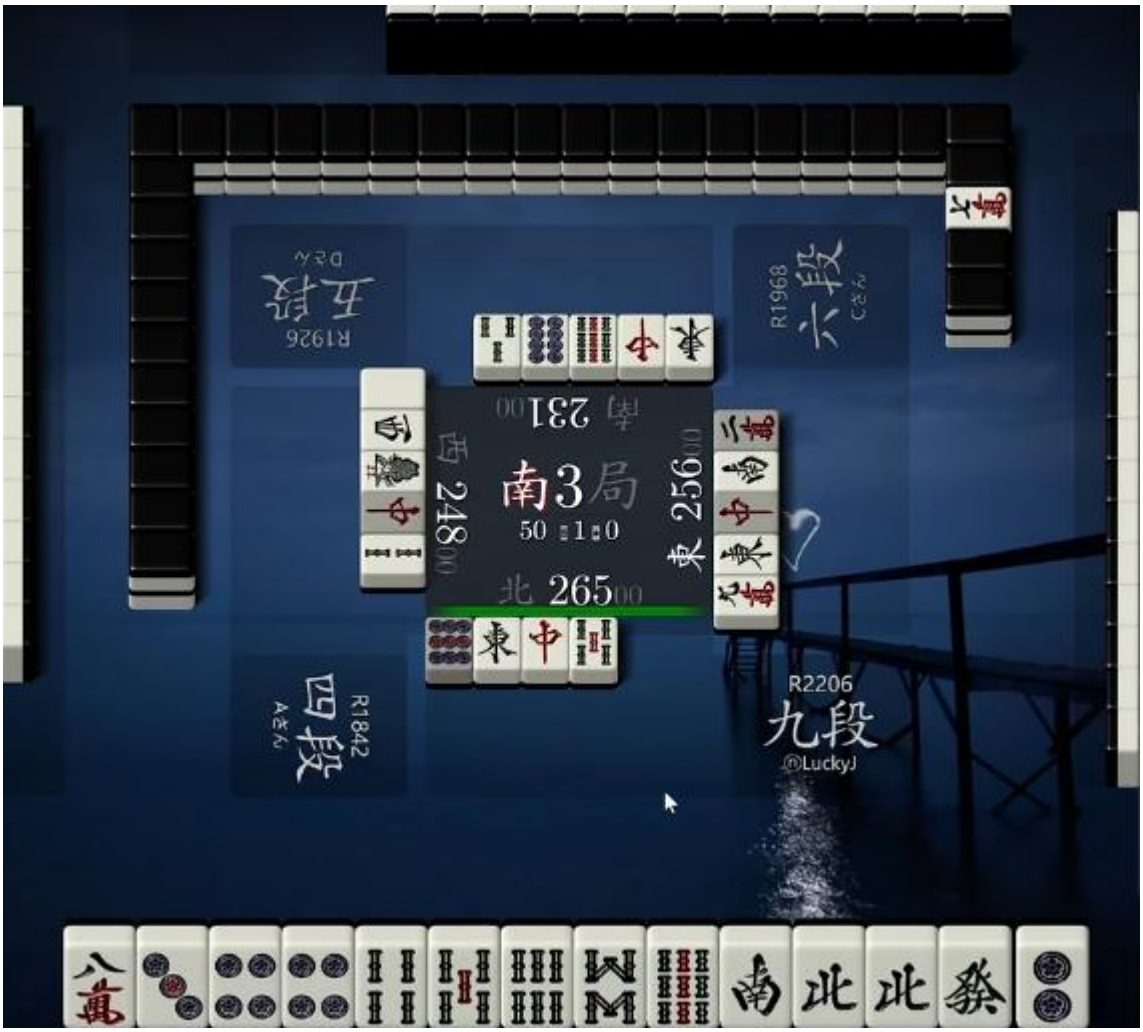
Thirdly, this counting method overestimates the importance of 5s, because even if 5s isn't the next discard, it can still become the next-next discard, or the one after that. 5s will only appear in the final shape if it forms a block before 8m does and before the hand gains 7s. This lowers the importance of 5s even more.

Finally, it's still the early game, and the hand has four blocks. It has enough ways to gain a fifth block, namely growing 8m, 344p, or pairing a lone honor, that it will not struggle for a fifth block to the point where it bottlenecks the hand, not more than the weak 89s block would. It doesn't also need 5s to help form a fifth block because its existing options are wide enough.

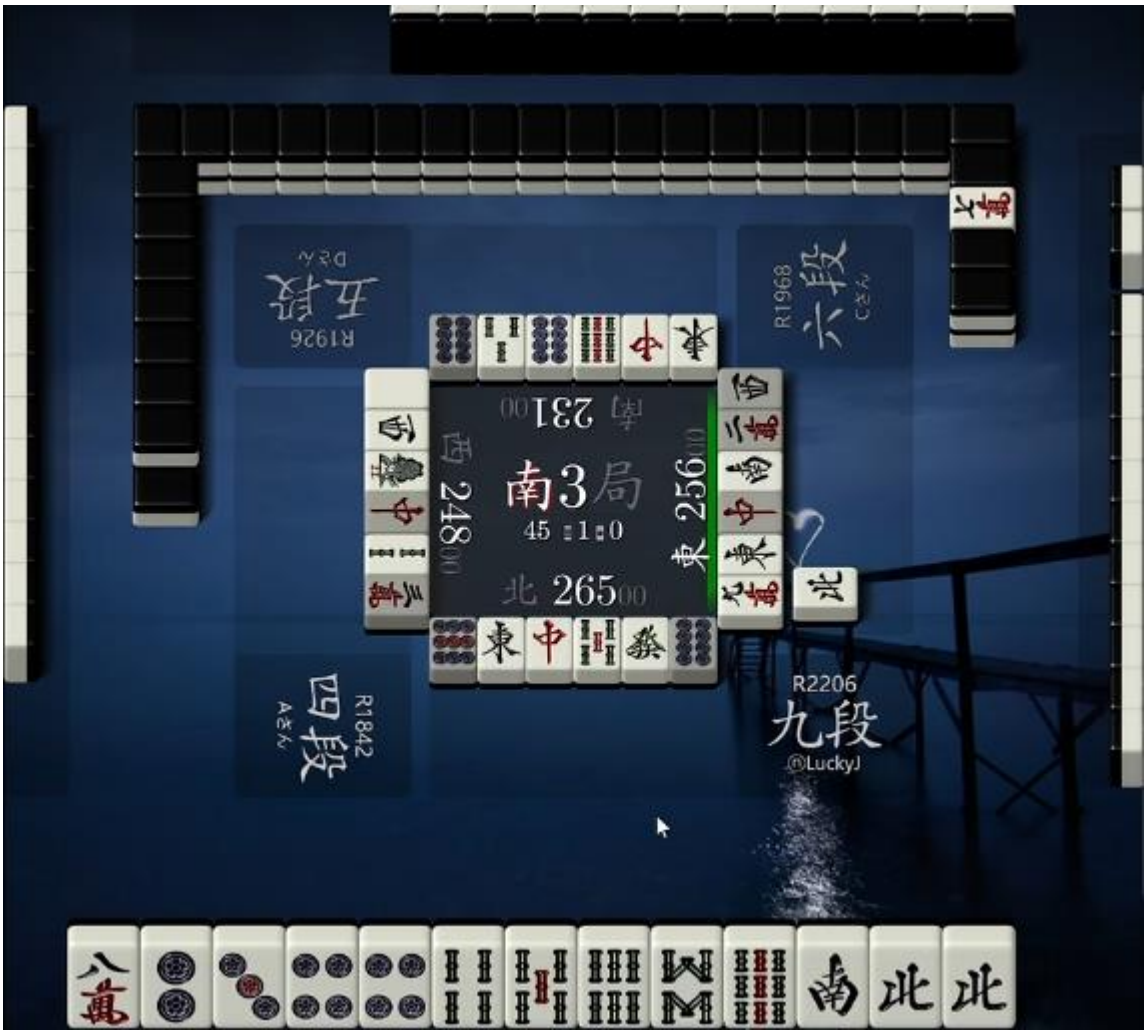
This explains why 5s is discarded over an honor, but there are still other options to examine.

The first is breaking 89s. This is wrong because the hand currently has four blocks. It's one thing to decrease its chances to form a fifth block, it's another thing entirely to go down to three. This hand will be open far more often than closed, and open hands have a strong tendency to prefer bad shapes over floating tiles because opening covers the bad shapes' speed weakness.

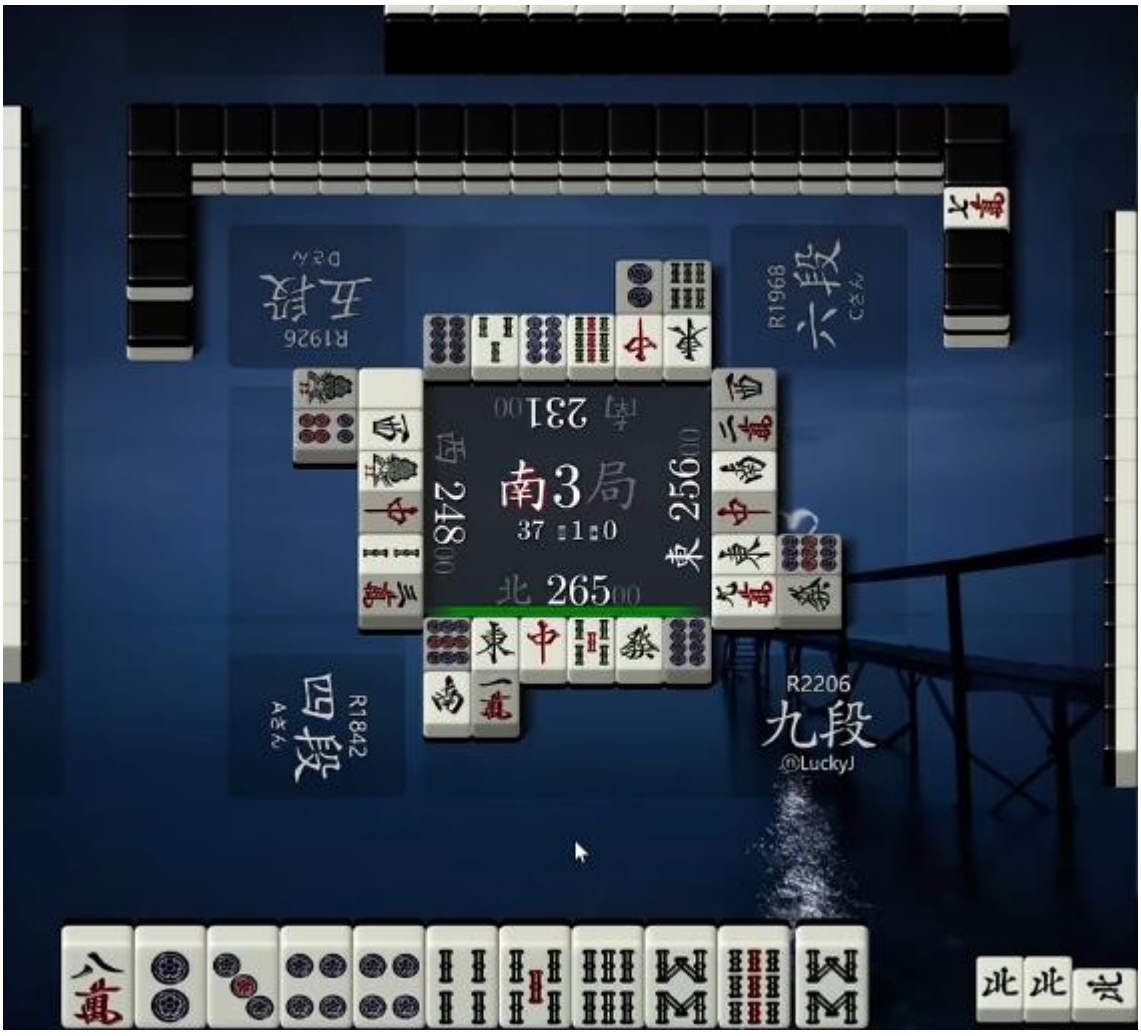
The second alternative is discarding 4p to pursue a flush. It's important to note the material efficiency loss in doing so. It means that upon completing the North triplet, the hand is headless. Also, at this score and round, sacrificing speed for value is one of the lowest priorities. Even if this hand draws perfectly by gaining South or Green Dragon followed by 4s or 6s, it will still have a hard time justifying discarding both 8m dora and the good 34p shape to commit to a flush. Even in this most optimistic scenario, flush and non-flush are about equal, considering all factors. If even the best effective tiles for flush result in an evenly split decision, it's clear that the flush should be avoided.



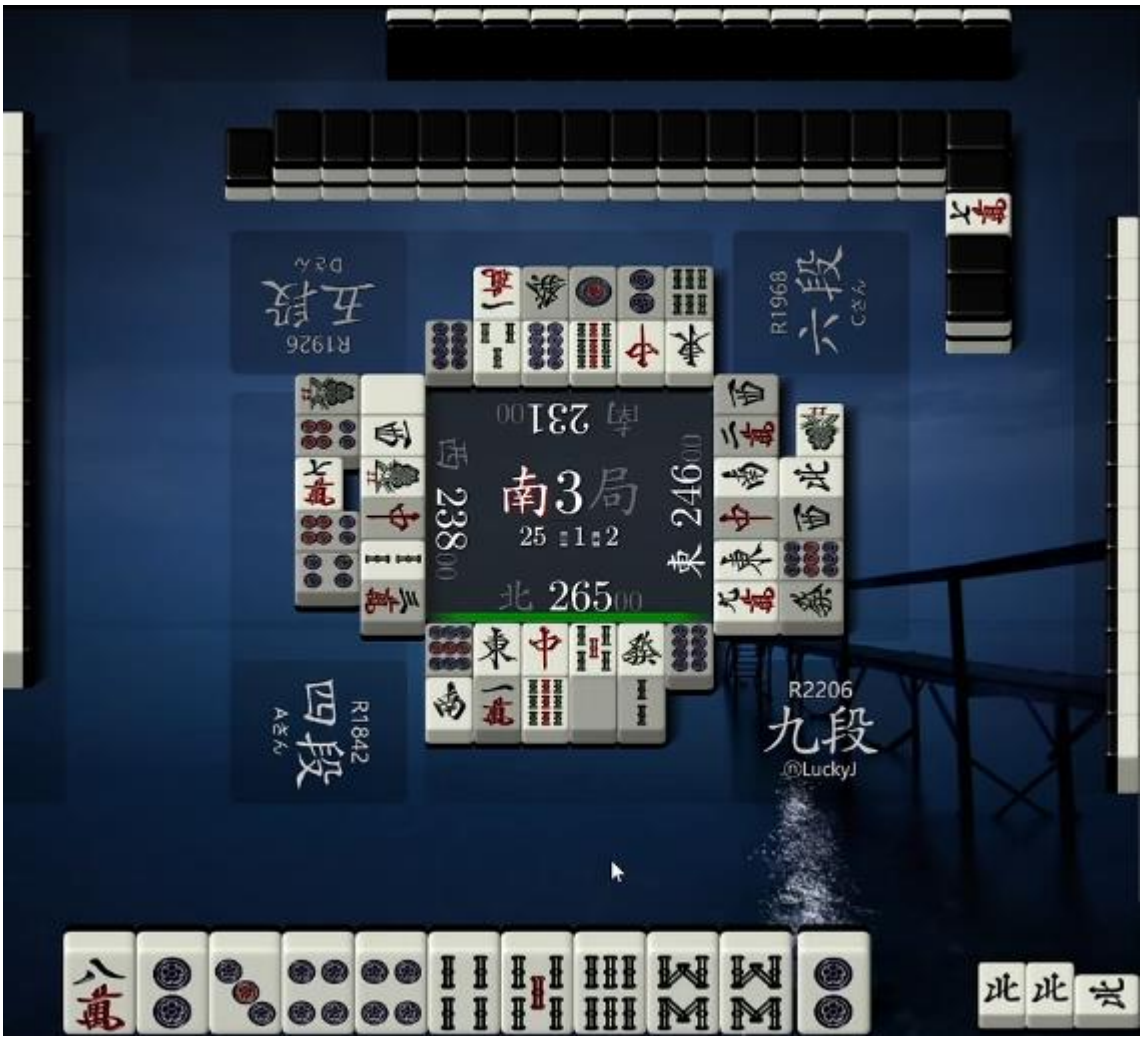
Since 2344p is likely to form two blocks, the robot now hedges for safety by **discarding Green Dragon** to save the once-cut and therefore safer South.



The robot **calls pon and discards South**. Although safe tiles are important at this score and round, speed is still the top priority. A bad shape 1-away hand needs every effective tile it can get. Without any opponent showing a particularly dangerous pond, score and round alone is not enough reason to keep a safe tile here at the cost of efficiency.



The robot **discards 9s** to upgrade to sticky 1-away.



After discarding some drawn safe tiles against one riichi, the robot faces another riichi as it reaches tenpai. It's unjustifiably risky to discard live dora into two riichis for a bad-shape, no-value hand. The robot folds by **discarding 4p**.

The round ends in a mangan deal-in from riichi to riichi.

Closing

This hand showed how much logic and reasoning can go into a single decision. It took many concepts combined to arrive at the 5s discard on turn 4. These concepts include knowing how nearby shapes affect each other's strengths, visualizing how the hand would look after gaining each of its effective tiles, picturing how a hand is likely to evolve on future turns, knowing the value of floating tiles, and knowing whether to pursue a flush. There's no such thing as a trivial early discard. Decisions in the early game may seem interchangeable and immaterial, but they could also be extremely deep and nuanced, requiring comprehensive strategy knowledge to get right, and decide the hand's overall direction for the rest of the round.

There are also more specific concepts to learn from this hand. The first is whether to break off-suit shapes to pursue a flush. It is almost always wrong to lose efficiency up front to pursue a flush with at least one off-suit dora and one off-suit good shape. This applies at nearly every score and round, not just nearly even scores close to the last round, where hand value greatly diminishes in importance.

Secondly, saving safe tiles is often wrong. With the advent of Suphx and LuckyJ, many intermediate players now incorrectly save safe tiles. This hamstrings their efficiency and hampers learning. Even LuckyJ, the robot most fond of safe tiles, playing at almost even scores near the last round where safe tiles are far more useful, chose not to save one upon reaching bad shape 1-away. This is despite the high risk of having dangerous floating tiles, including dora, get stuck in hand later. In most cases, the first plan for a hand should be to win it. Tactics like preparing to fold, assisting an opponent, or holding key tiles to slow opponents down should be reserved for special circumstances and used sparingly, not at every opportunity.

Thirdly, be vigilant about the true values of various floating tiles in a hand without a stable head. While needing a head alone usually doesn't make a middle tile worse than an honor, it is one factor that can compound with others to reverse those tiles' relative importance. The most useful tool to judge when this may be the case is visualizing how a hand will likely evolve on future turns. This kind of visualization, along with situational awareness, is one of the secrets to improving beyond the intermediate level.

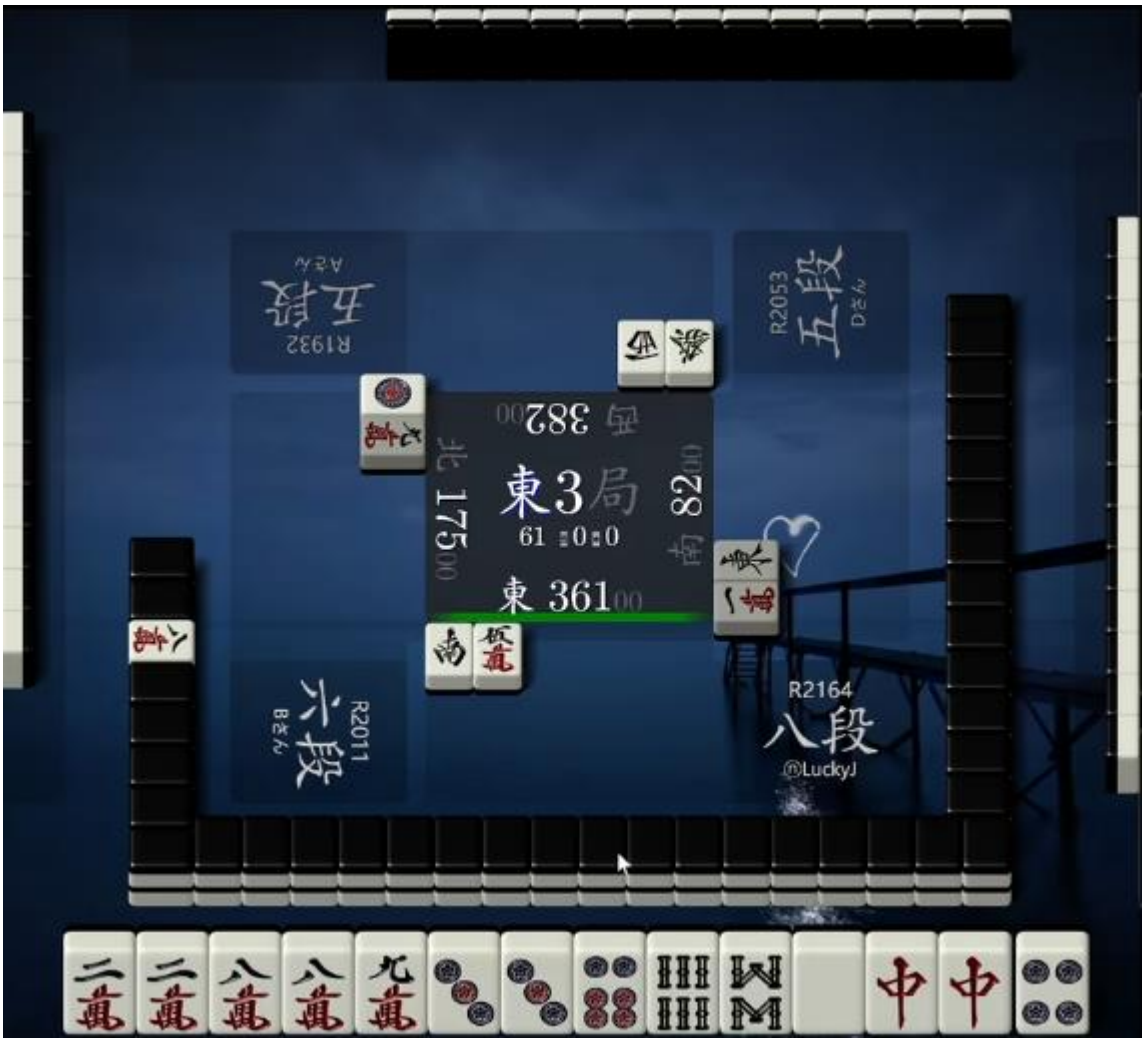
Hand 12

East 3, second place, close behind first and far ahead of third. This score situation, along with being dealer, is one that calls for far more aggression than usual. Despite this, to play such a slow starting hand correctly, care must be taken beyond pure tile efficiency.

This exact hand pattern, with all bad shapes and four pairs, including one of yakuhai, is one of the trickiest to play in the whole game. Normally, chiitoi is the obvious direction with four pairs and all bad shapes, but the yakuhai pair enabling opening all the bad shapes greatly diminishes chiitoi's advantage.

Since chiitoi is 2-away and regular shape is 3-away, and since chiitoi can more easily use another dora, chiitoi is still the hand's main direction, with regular shape as a backup plan. This means the only discard candidates in this hand are 5m and 6p. White Dragon is too valuable as both a chiitoi wait and a regular shape value booster to discard.

The robot **discards 5m**, the hardest tile to pair for chiitoi that also has its efficiency reduced by nearby shapes. Discarding 6p to keep flush chances alive looks like an option, but the shape in the man suit is too bad to form the blocks required. Also, with chiitoi as the hand's main direction, it's hard to imagine breaking the 3p pair for a flush. Overall, this makes pursuing a flush unviable, and 5m remains the better discard than 6p.



The discard that keeps four pairs and maximizes 3-away acceptance is 6p, which seems like the obvious move. However, the robot **discards 8s** and sacrifices 8 effective tiles.

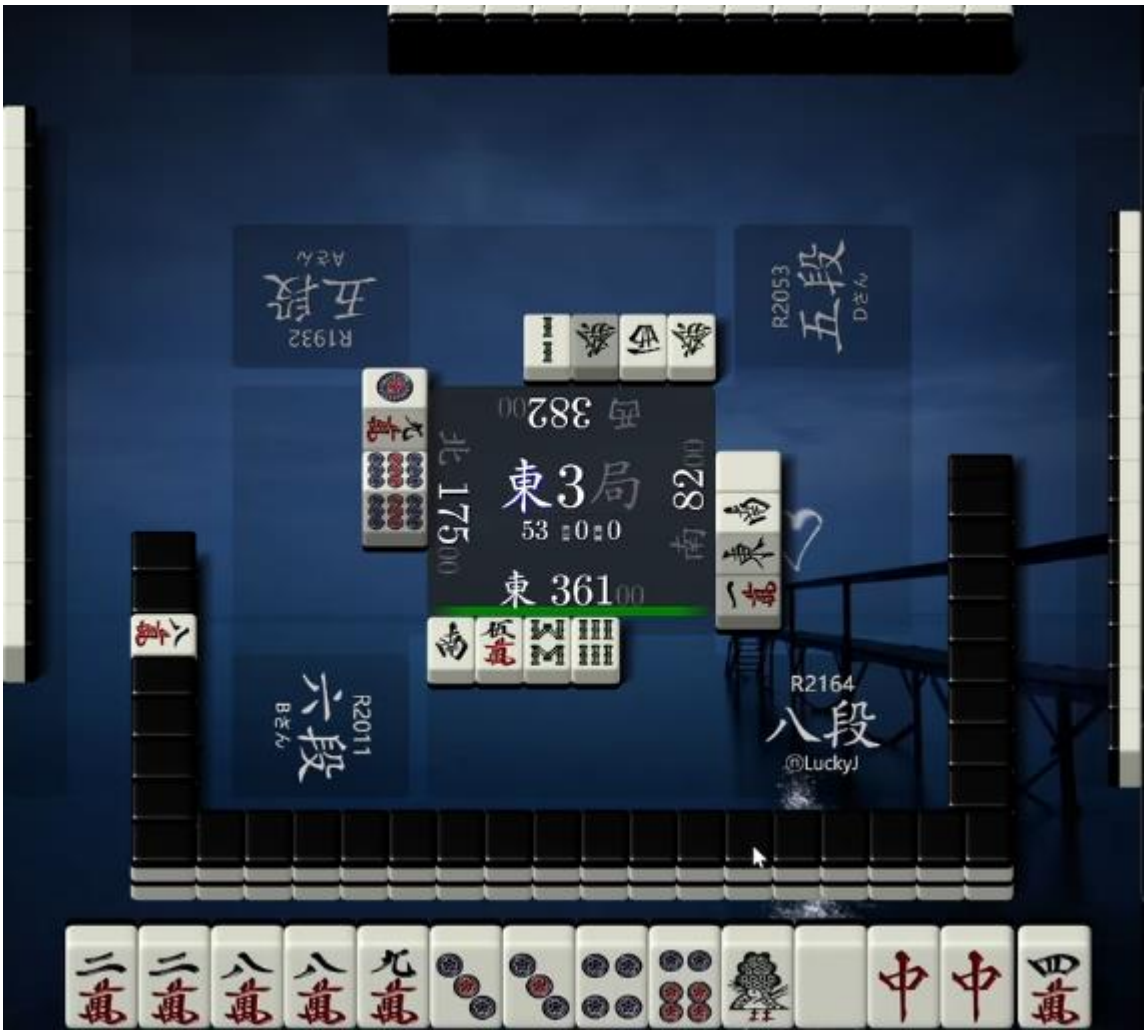
There are two reasons for this. Firstly, comparing the two kanchans of 46p and 68s, it is obvious that 46p is more rewarding to fill, both because red 5p exists and because 33456p is far better at growing horizontally than 33p plus an unconnected 678s.

Secondly, imagine discarding 6p and gaining 2p or 7s, the lost effective tiles from breaking 68s. The next discard, to maintain 2-away for both chiitoi and regular shape, would be White Dragon. For a hand with chiitoi as its main direction, this is a huge blow to both speed and safety, making those 8 effective tiles far less valuable than the raw tile count indicates.

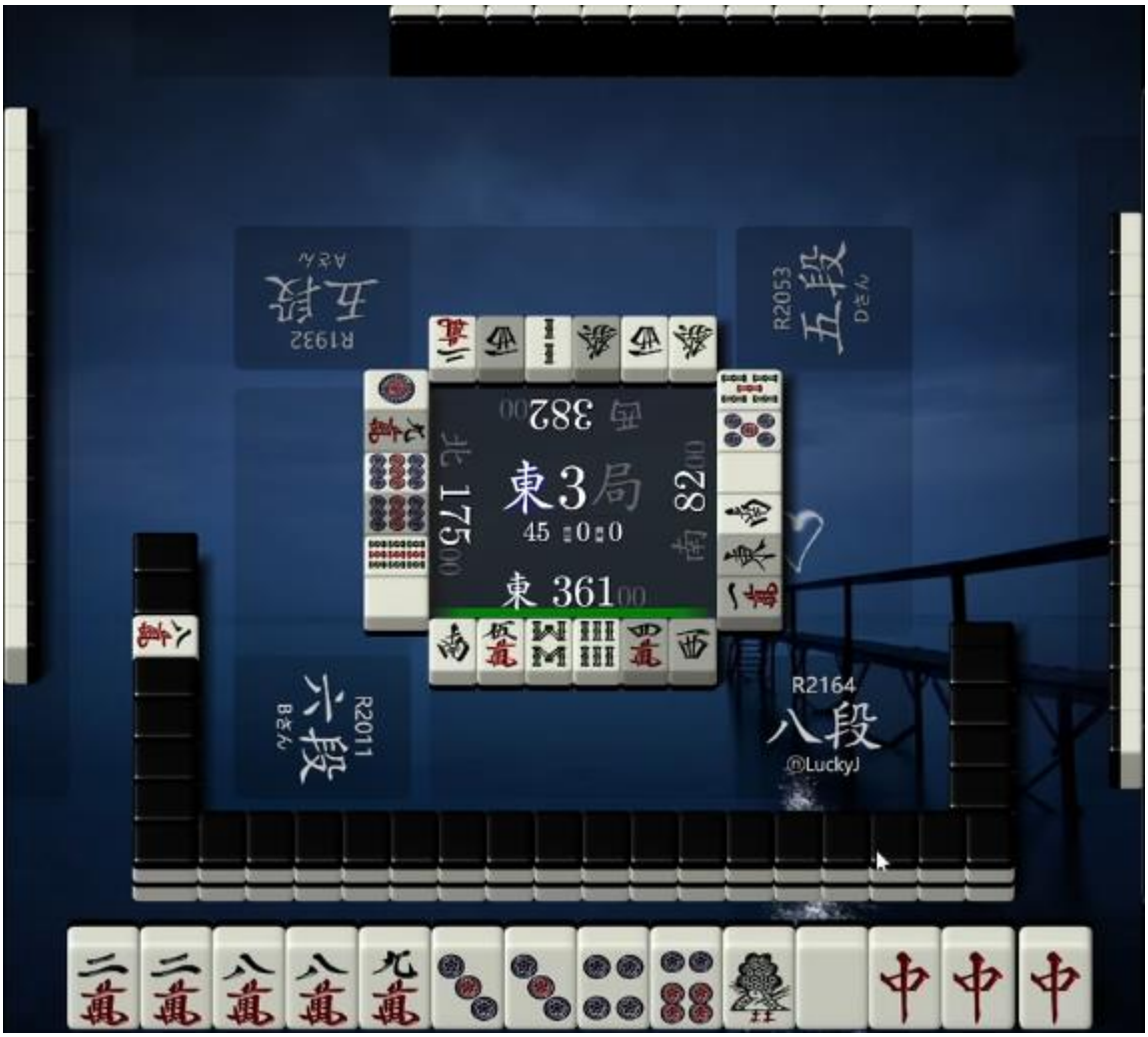
Another way to look at it is in terms of hand space. For any hand with chiitoi as its main direction, pairs will never be discarded. Even if a complex shape forms a sequence, the attached pair still needs to be kept. This takes up an extra spot in the hand, a spot that

could otherwise hold a good chiitoi wait or valuable floating tile, and greatly reduces the hand's flexibility. All of this means complex shapes like ryanmen pair and kanchan pair are far less valuable in a chiitoi hand than a regular shape hand. 3346p in this hand is much closer to two blocks than one. 46p is a better block than 68s, so 68s is broken first.

The robot **discards 6s** to keep another excellent pair candidate. Note that, had the previous discard been 6p, this hand would now discard 1s for lack of space. Had that happened, it would have amounted to improving a cheap 3-away regular shape in favor of the valuable 2-away chiitoi, not a favorable trade.



Following a similar logic as previous turns, the robot **discards 4m**, sacrificing 3 regular shape effective tiles to keep a better pair candidate.



Red Dragon is this hand's best possible draw for regular shape and elevates it to be as viable as chiitoi. Since this is still a bad shape, 2-away hand and it's now the midgame, the robot **discards 1s** to keep a safe tile.

After several turns of discarding its draw to keep a safe tile, right-hand opponent opens their hand.

Next turn, the robot **discards 9m**. This is a mistake because 9m is safe against all opponents, so there's no reason not to hold it for speed and value. The correct discard is White Dragon.

It's now approaching the late game and the hand is still 2-away. At this stage, 3s has a non-negligible deal-in rate, so the robot **discards White Dragon** and awaits developments.

The robot **discards 8s**, a safe enough tile against the open hand, to keep 2-away.

The robot **discards 3s** for 1-away. Although 3s is dangerous, dealing in is far less impactful in this score situation than usual, making it worth risking for at least tenpai at draw.

The robot **discards 3m**, another dangerous push for tenpai, motivated by the score situation.

To maintain 1-away, the possible discards are 7m, 8m, 4p, or 8p. Out of these, 4p or 8p are far safer. There's not much difference between the two, and the robot **discards 4p**.

Despite its efforts, the robot **discards Green Dragon**, ending the round without tenpai.

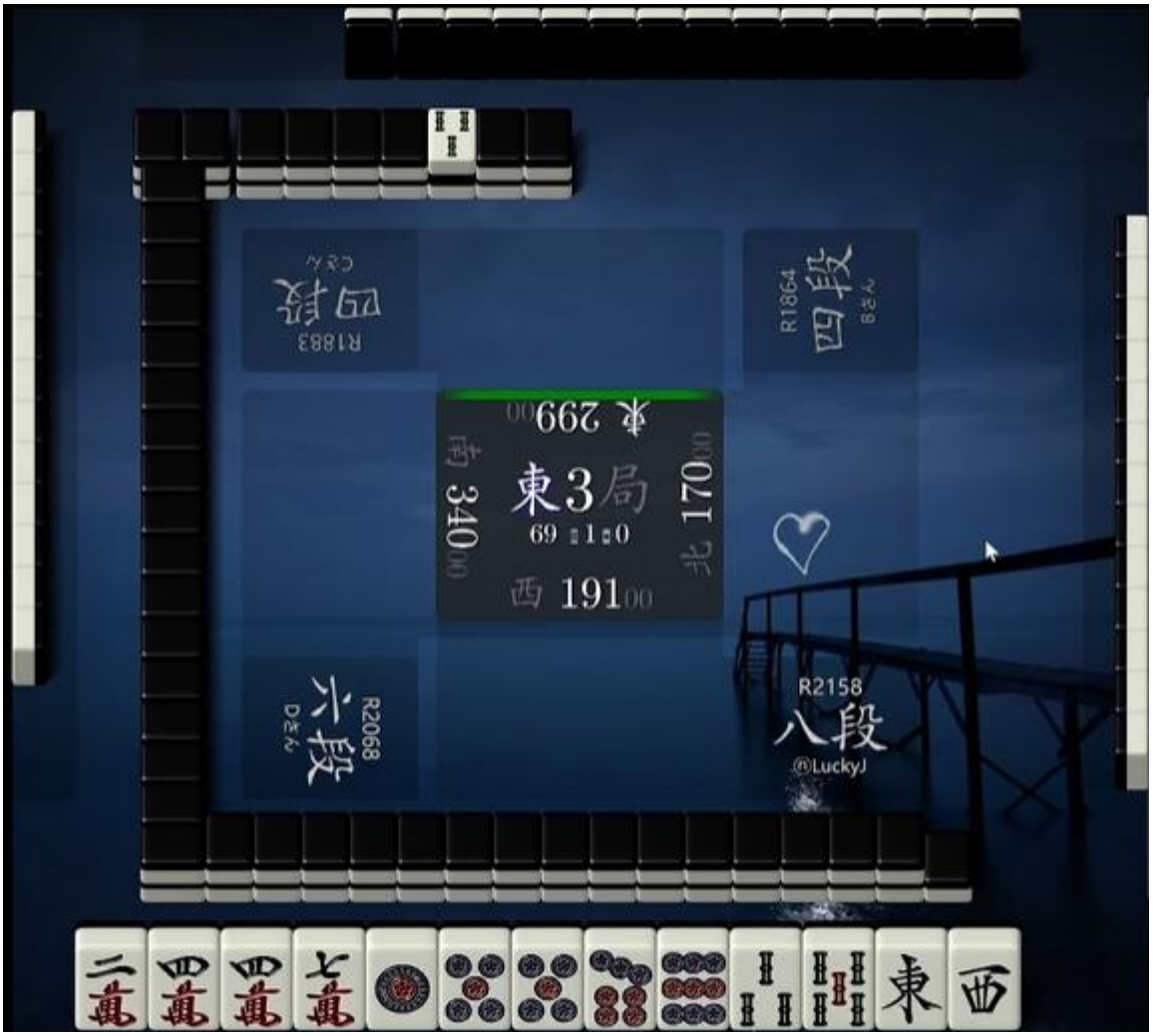
Closing

This round is a showcase of how to play a hand where both chiitoi and regular shape are viable. For this hand, chiitoi was clearly the better option, with fewer shanten and higher value, and regular shape was a backup plan until the Red Dragon draw made it equal. In contrast to previous episodes where it combined chances, the robot focused on only this hand's main direction at the expense of side options.

This is not a contradiction. Combining chances only applies to situations where each possibility is about equally viable, not where one option is clearly the best. Knowing when to combine chances and when to commit to the main option is an important skill that helps immensely in navigating the early game. Studying the logs of robots like LuckyJ and Suphx can be of great benefit in this area, as they are particularly good at it.

The robot made an obvious mistake this round, the discard of 9m which slowed itself down without compensation. Rather than using cases like this to dismiss robot play as inapplicable and somehow inferior, a better attitude is to identify them as errors and not blindly copy the robot while still learning from robots' other decisions. If anything, this kind of error shows how far we still are to achieving perfection, if such a thing is possible for mahjong. To get as close as possible to this imagined perfection, one must first keep an open mind and a critical attitude, not imagine oneself already there.

Hand 13



East 3, third place. No adjustments are needed for the score and round.

On turn 3, the robot **discards East** to reduce the chance of someone calling pon on it. This hand has good enough shape that it doesn't need a potential East triplet to speed it up. Next turn, it faces a difficult decision.

This hand is 3-away, which means value and safety are just as important as speed, as it can still afford to lose acceptance for them. With how far away the hand is from tenpai and the number of bad shapes it contains, it is likely to play from behind. The possibility of open tanyao also makes West more valuable for safety. For these reasons, West must be kept.

Apart from West, 2p is the most efficient discard. If 2p is discarded, the hand would have two heads, both of which are part of complex shapes. When this is the case, completing one shape fixes the other as the head, making its complex shape ineffective. Apart from this, the other material efficiency loss from discarding 2p is the shanpon acceptance for open tanyao.

Imagine discarding 2p then drawing 3m. The next discard would be 9p, breaking a bad shape for tanyao and shape improvements, leaving 2344m as a backup head candidate. If it is the case that the next discard is not 4m upon completing 234m, then 244m in this hand is not a complex shape, but rather 44m plus a floating 2m. Drawing 3m is not as much completing a block as it is extending a floating tile to a joint.

Another way to think about this position is by evaluating the quality of the 3m acceptance. If 2p is discarded here, then 3m is drawn, the resulting 2-away hand is so poor that it should revert to 3-away for improvement. This means 3m, despite appearances, isn't effective at advancing the hand to 2-away at all.

Since 8p, unlike 3m, does result in a 2-away hand good enough to not revert to 3-away, it is too early to break 79p for tanyao. The robot **discards 2m**.

Live yakuhai is too dangerous to keep at this stage. The robot **discards White Dragon.**

The robot **discards 2p**, the most efficient play that keeps West for safety.

The reasoning that made the robot keep 2p on turn 4 does not apply on this turn. Here, there's no issue of two complex shapes making each other redundant, nor is the potential 2-away hand from drawing 2s so weak that it should be reverted to 3-away.

The hand gains a sixth block. The robot **discards 7p**, breaking its weakest one. Although discarding 1s loses the same number of effective tiles, 5 blocks instead of 6 is the default play.

The hand is now 2-away for chiitoi. The robot **discards 9p**, the natural play that preserves this possibility.

The robot **discards 1s**, foregoing two effective tiles for chiitoi, tanyao, safety, and because the 135 block benefits far more from drawing 4s than 2s.

Right-hand opponent breaks 12s and 45s to riichi, all but guaranteeing their wait is good shape. The player across seems to be pushing. The robot **discards West**, its saved safe tile, to buy time.

Left-hand opponent is also pushing. The robot **discards 4s**, safe against all opponents, foregoing regular shape for 1-away chiitoi.

The player across deals in with 5p.

Closing

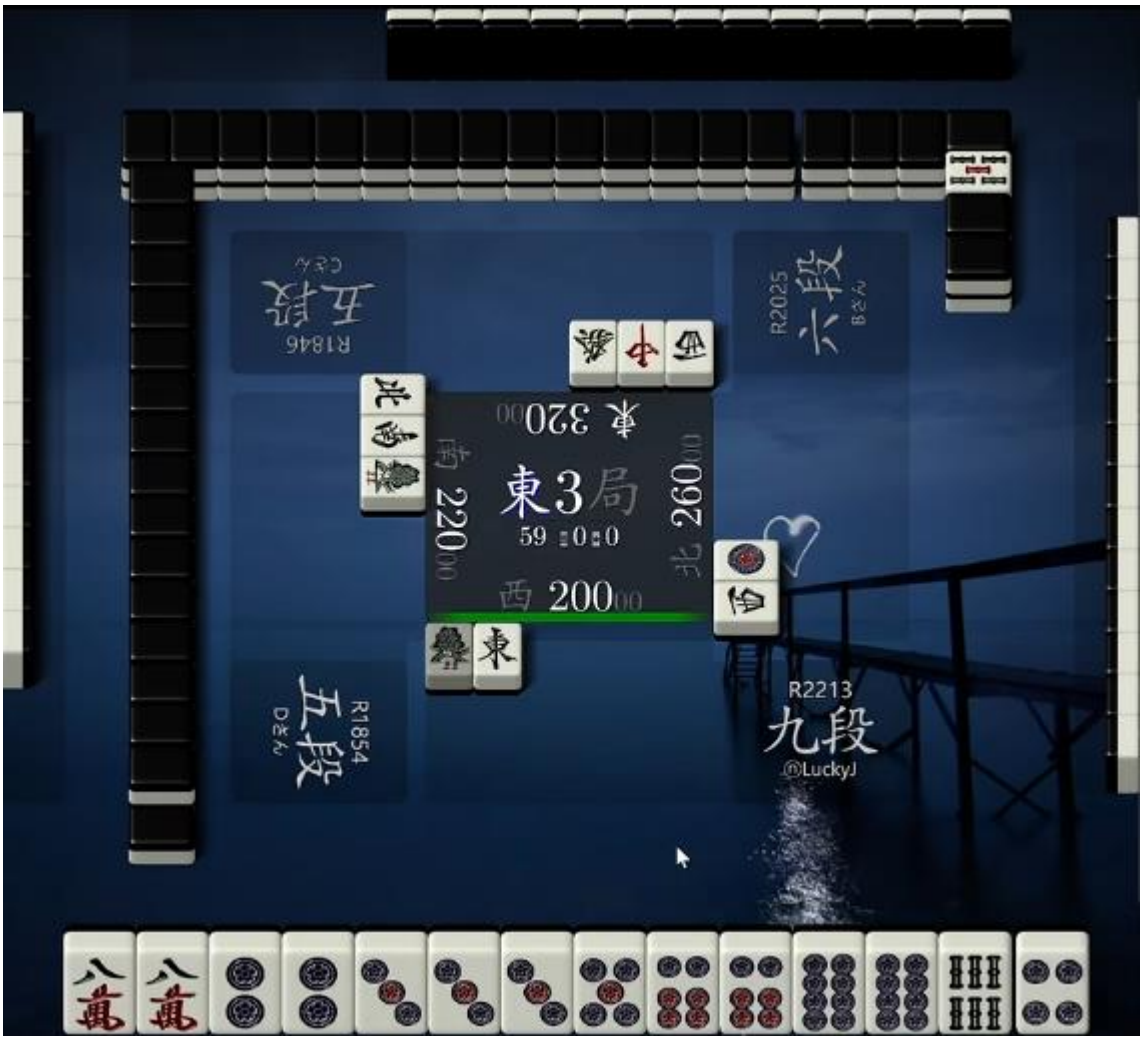
There was only one difficult decision in this hand, the 2m discard on turn 4. It relied on a strategy principle: when a hand has two heads, both of which are part of complex shapes, the two complex shapes weaken each other because completing one makes the other ineffective. Consequently, it is often correct to fix one of the heads by breaking its complex shape extension.

Other strategy principles were also shown, including evaluating the quality of an effective tile, keeping safe tiles with a hand likely to play from behind, and considering not only speed but also value and safety when a hand is far from tenpai. Previous articles in this series covered these concepts more in depth, which are reinforced here.

Another notable point is how hand-reading is never 100% reliable. Despite reading right-hand opponent for good shape since they discarded two joints to riichi, including one good shape containing dora, it turns out they did so for value with bad shape instead.

Hand 14

East 3, last place. This doesn't affect strategy much because it's an early enough round and small enough deficit.



The robot reaches 1-away for chiitoi. Tanyao chinitsu is within reach as early as turn 2. This is an exceptional hand. Next turn, it faces a tough choice between several possible hand-building paths.

Before choosing a discard, take a moment to read the hand. This hand is 1-away for chiitoi with 4p, 5p, and 6s as pair candidates. It is also 1-away for tanyao with 88m, 22p, and 688p as incomplete blocks. The score for this 1-away ranges from 1000-point open tanyao to mangan sanankou. In addition, it is 2-away for chinitsu for up to haneman if also tanyao. Since it's still early, chinitsu scores far better, and chiitoi and tanyao 1-aways only contain bad shapes, chinitsu is the hand's obvious main direction. For this reason, all pinzu should be kept. The only discard candidates are 8m and 6s.

The benefit to discarding 6s is keeping all three paths of chinitsu, tanyao, and chiitoi intact. Chinitsu, tanyao chiitoi, and tanyao tsumo sanankou are all mangan-grade hands. If 6s

weren't dora, it would be the obvious discard. But since it is dora, discarding it immediately concedes value. The alternative, 8m, lacks this concession and requires examination.

8m makes the hand 1-away for both chiitoi and tanyao. The chiitoi acceptance it brings, 4p and 5p, also advance chinitsu. If 8m is kept and 4p or 5p is drawn, it's unclear whether it's correct to refuse chiitoi tenpai for chinitsu (it depends on turn number and each opponent's speed). This greatly diminishes the value of chiitoi because gaining 45p is highly desirable, even if they aren't chiitoi tenpai. The marginal value of keeping 8m for chiitoi does not make up for the immediate value concession from discarding dora.

For regular shape, compared to a potential haneman chinitsu, 1000-point open tanyao is not worth considering this early. The main question, then, is whether 8m is worth keeping for sanankou. Following a similar logic as the chiitoi case, out of all effective tiles the hand can gain towards tanyao, 2p, 7p, and 8p also advance chinitsu, diminishing the importance of tanyao tenpai. Since chinitsu is too valuable, the hand will likely decline to pon 8m. This leaves drawing 8m before gaining any other effective tile the hand's only way to realize 8m's sanankou potential, which is far too narrow to be worthwhile.

After this reasoning, it becomes clear that 8m only gives low-value acceptance that this strong hand can do without. The robot **discards 8m** to keep higher-value effective tiles around 6s, which gives red 5s and 6s acceptance that are clearly valuable enough to reject chinitsu.

The 78m joint is even lower value than the previous 88m. The robot **discards 7m** following a similar logic as the previous turn.

Since all effective tiles around 8m are useless based on the previous reasoning, the robot **discards 8m** to keep a safe tile.

The robot **calls pon and discards 6s**, committing to chinitsu and foregoing sticky acceptance around 6s for safety. Given that it's near midgame, the likely 2-han hand from sticking 6s does not make up for the higher chinitsu success rate by keeping a safe tile for a possible later counterattack.

The robot **calls chii and discards Green Dragon**. Although the wait is horrible, it can still improve, and haneman tenpai is too good to pass up.

The robot **discards 2p** to improve its wait. Discarding 4p improves to the same wait and preserves the option to kan 3p, but it would mark 8p and especially 5p as more dangerous and less likely to be discarded, lowering win rate unacceptably far.

The hand goes to exhaustive draw for 1000 points tenpai payment.

Closing

This hand illustrates the strategic principle of commitment. When a hand's main direction is both fast and valuable enough, it's better to fully commit to it rather than keep side options open. In this scenario, any side options should be chosen for value far more than speed. This does not contradict the strategy of keeping options open and combining chances. Rather, it takes experience and judgment to decide which is the case. One factor in deciding whether to commit is turn number. The later it is, the more viable it is to commit, as shown by the robot's 6s discard on turn 6.

Another thing to note is mahjong's inherent variance. No hand, no matter how good, "deserves" or "is entitled to" winning. This hand had a phenomenal start, was tenpai for haneman from turn 8, and didn't win. This was not unusually bad luck, but rather normal for mahjong. The mental skill to weather these random events is just as important as the techniques of choosing what tiles to play.

Hand 15

South 1, third place as dealer. Strategy is not affected much, except a slight emphasis on value.

After discarding some terminals and honors in the usual order, the robot faces a key decision.

This hand has five blocks, one of which is good shape, the rest are bad shape. With three pairs, it is 3-away from both chiitoi and regular shape, with chiitoi more likely to use the floating honor dora. This kind of hand is easy to mess up, as the player is never quite sure if or when to commit to chiitoi or regular shape.

Since the concept of shape doesn't exist for chiitoi, the hand's regular shape strength is the biggest factor in deciding its direction. With only one good shape, chiitoi is viable enough in comparison that shapes like 122m and 112p should keep their pair extension even if they become a sequence. This immediately eliminates 2m and 1p as discard candidates.

If this hand gains a tile towards regular shape, the next discard is probably breaking 89p to keep both dora for value and floating tiles for shape, to avoid a bad-wait, no value hand that cannot open. However, this does not make 89p the correct discard on this turn. Since

breaking 89p loses 7p acceptance, it should only be done when all other discards lose more than that. Currently, the acceptance of 3m and 3p are both weaker than 7p because they require an extra space in the hand to keep holding their pair.

Given this reasoning, the correct discard is either 1m or 2p. The robot **discards 1m** because it sees 1p and 4p in other players' discards, making 2p both more abundant in the wall and slightly safer.

After discarding 1m, the plan for the hand is clear. If it gains a fourth pair, commit to chiitoi. On most gains toward regular shape, 89p should be broken for shape and value improvements, including continuing to hedge chiitoi. One exception is gaining 1p, upon which 2p is the next discard since it is too weak as a floating tile compared to direct 7p acceptance. Another exception is drawing 7p directly, then West is the next discard to commit to regular shape.

Right-hand opponent soon opens three times, prompting the robot to fold.

Right-hand opponent wins cheaply to end the round.

The position on turn 4 is worth further exploration for deeper understanding. One good way to do so is to see how the optimal strategy changes with slight changes to the position.

1. For instance, what if the 1m were 3m instead?

2. And what if 112p were further replaced by 223p?

Answers on the next page.

Answer 1: **Break 89p**. With two good shapes, a gain of 3p is strong enough to commit to regular shape and displace 1p. This means the 3p acceptance is no longer weaker than 7p for needing another hand space to keep holding the 1p pair. Since West is the hand's only source of value, it counts as its own block at this early stage, making 89p the hand's weakest block.

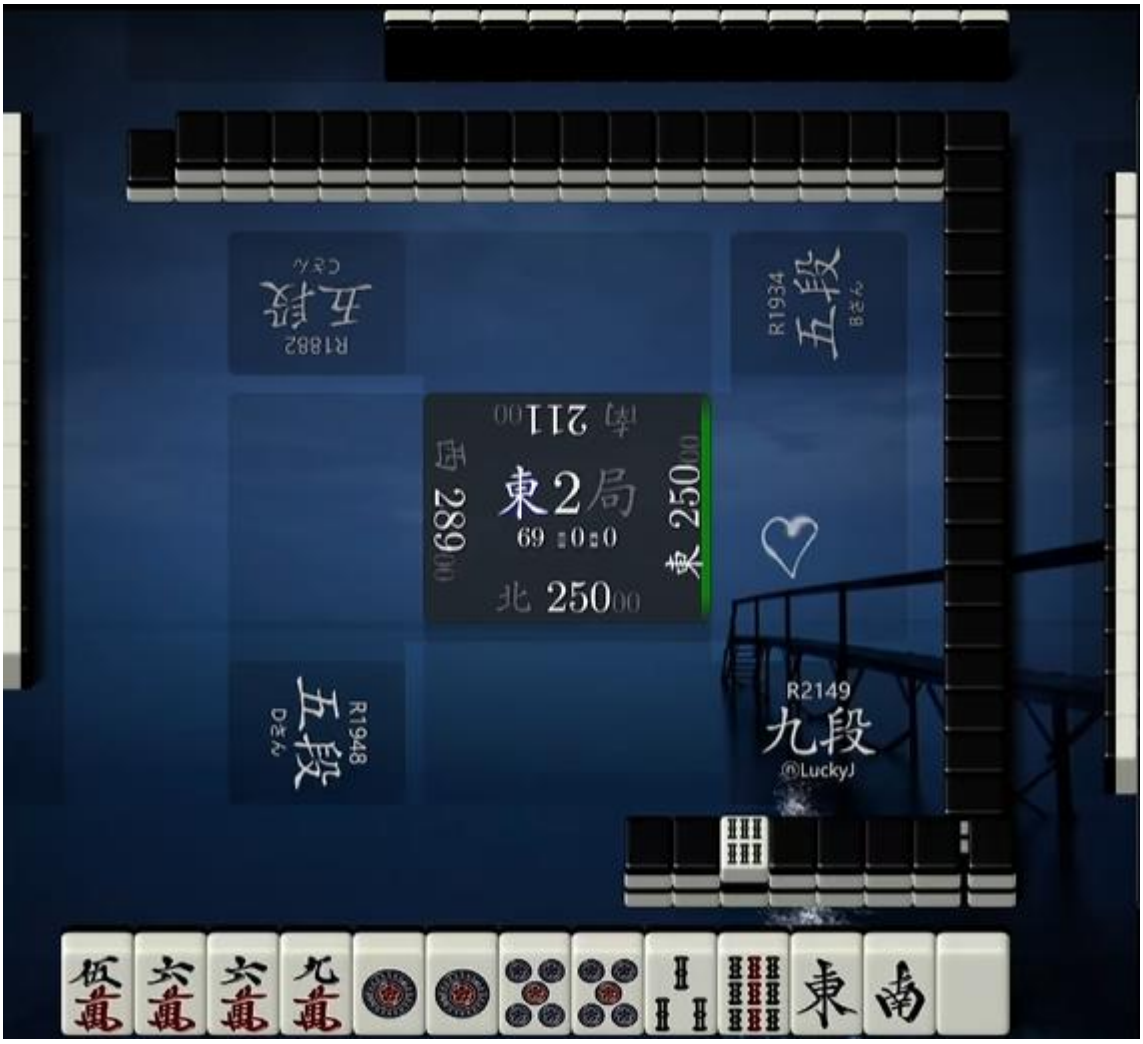
Answer 2: **Discard 2m**. With three good shapes, regular shape is strong enough that chiitoi is not relevant. 2m, breaking the third pair from the strongest ryanmen, is the standard play to hold West for value.

Closing

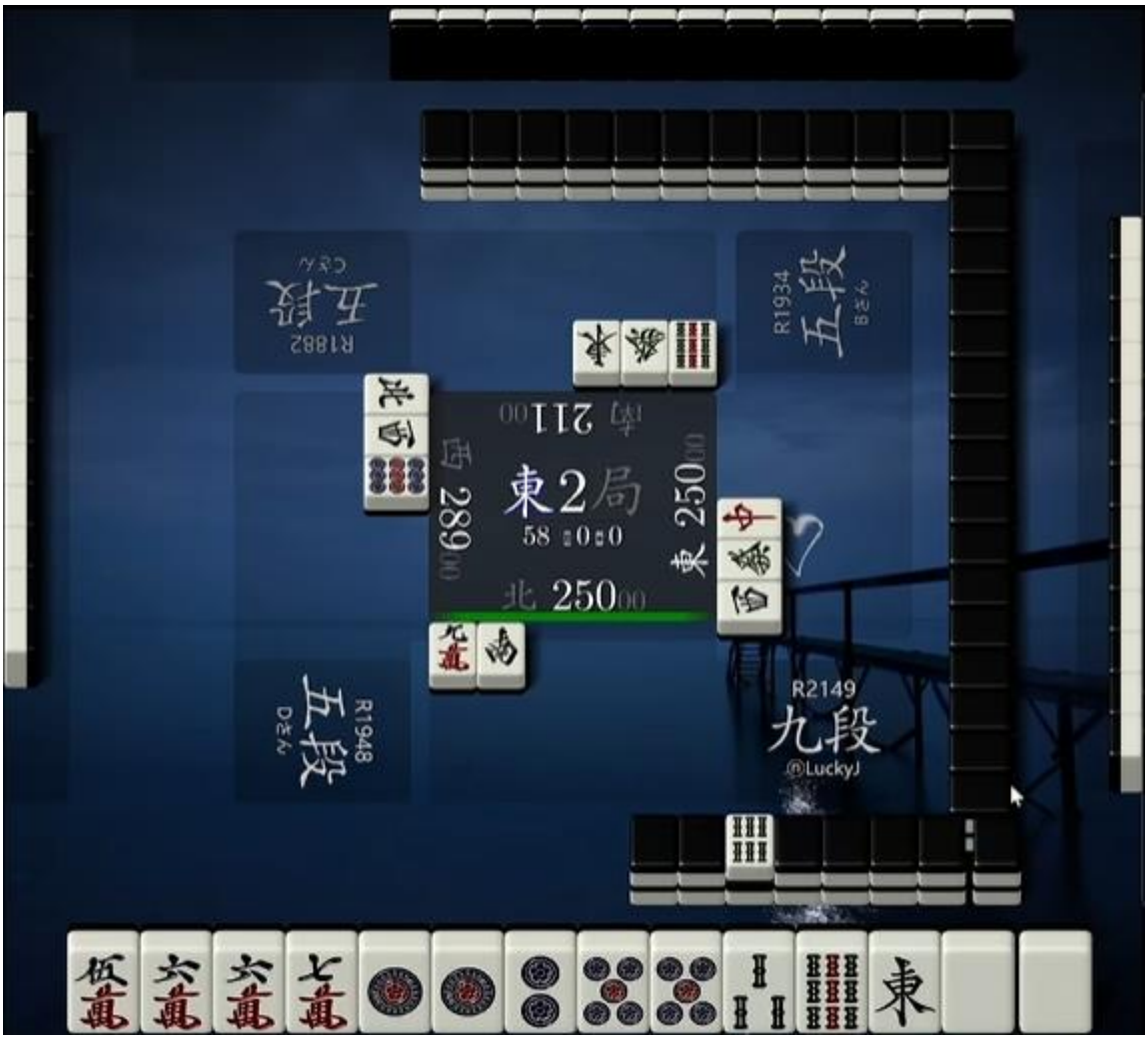
Chiitoi vs. regular shape is one of the hardest early-game decisions. This hand shows a good way to approach them, by first determining the strength of the regular shape hand. Before this can even be done, chiitoi needs to be recognized as a viable path in the first place. Even with only three pairs, the hand's multitude of bad shapes made it possible. The other strategic point worth remembering is how chiitoi being viable weakens shapes like ryanmen pair and penchan pair because they still can't afford to discard their pair upon becoming a sequence.

This hand also showcased the learning technique of tweaking a discard problem slightly and seeing how the answer changes with each tweak. Instead of only learning how to play a specific position that will probably never happen again, this allows for learning the best strategy for a range of positions, where similar situations are far more likely to occur in the future.

Hand 16



East 2, even scores. No adjustments for score and round.



After a couple turns of discarding useless terminals and honors, the robot faces a key decision.

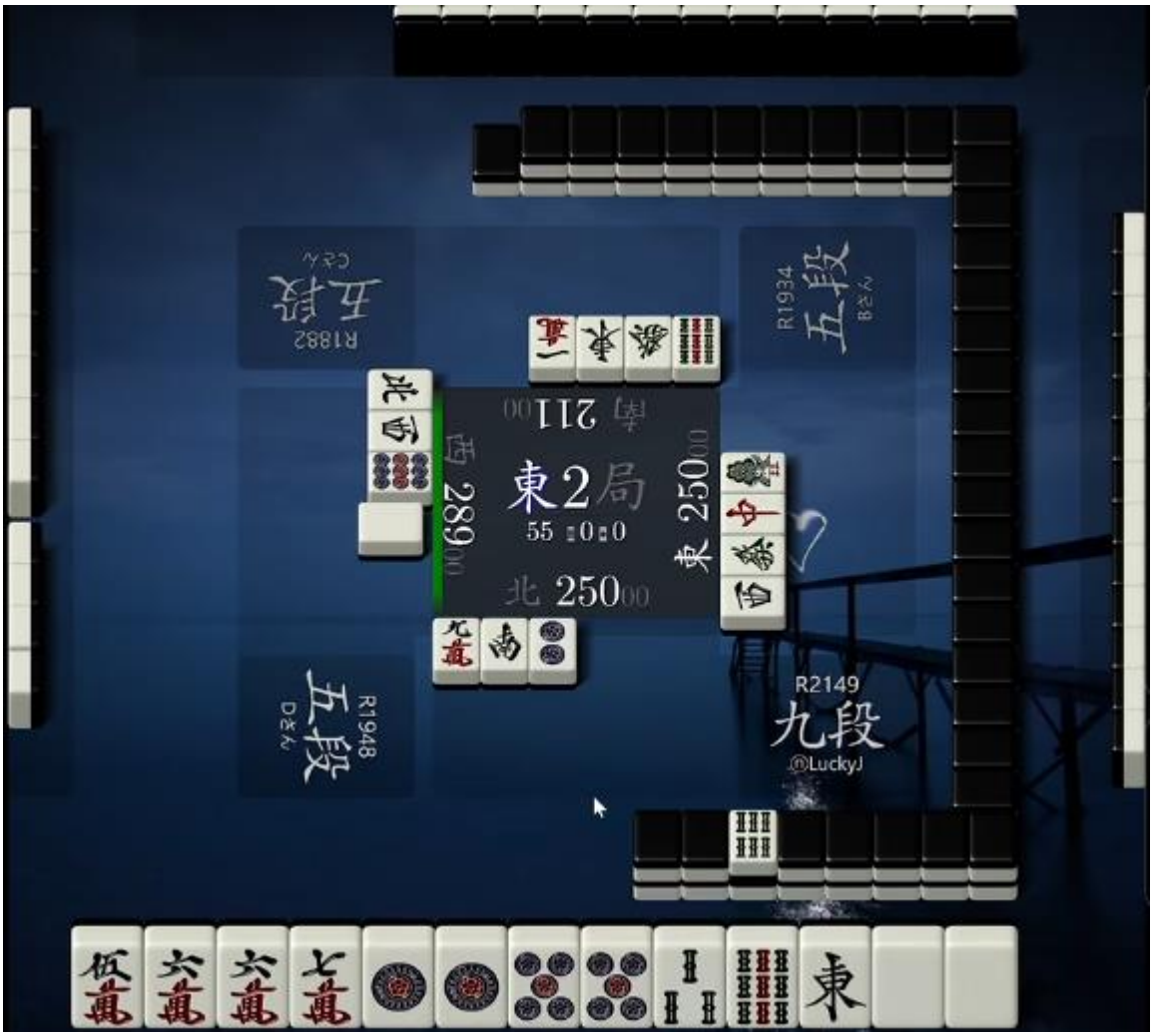
This hand has four blocks, one of which is complete, and four pairs, one of which is yakuhai. It has 0 dora, is 3-away from regular shape, and 2-away from chiitoi.

Compared to the above hand from Episode 12, this episode's hand is "sticky 3-away", significantly better than the 3-bad shape 3-away from before. Unlike that hand, this hand has far greater ability to rush a quick win by opening for White Dragon. For this reason, greater emphasis should be placed on regular shape, particularly the gain of 3p. Drawing 3p makes regular shape fast enough to overtake, if not outright obviate, chiitoi in expected value. Consequently, discarding 2p would lose 4 fully effective tiles of acceptance.

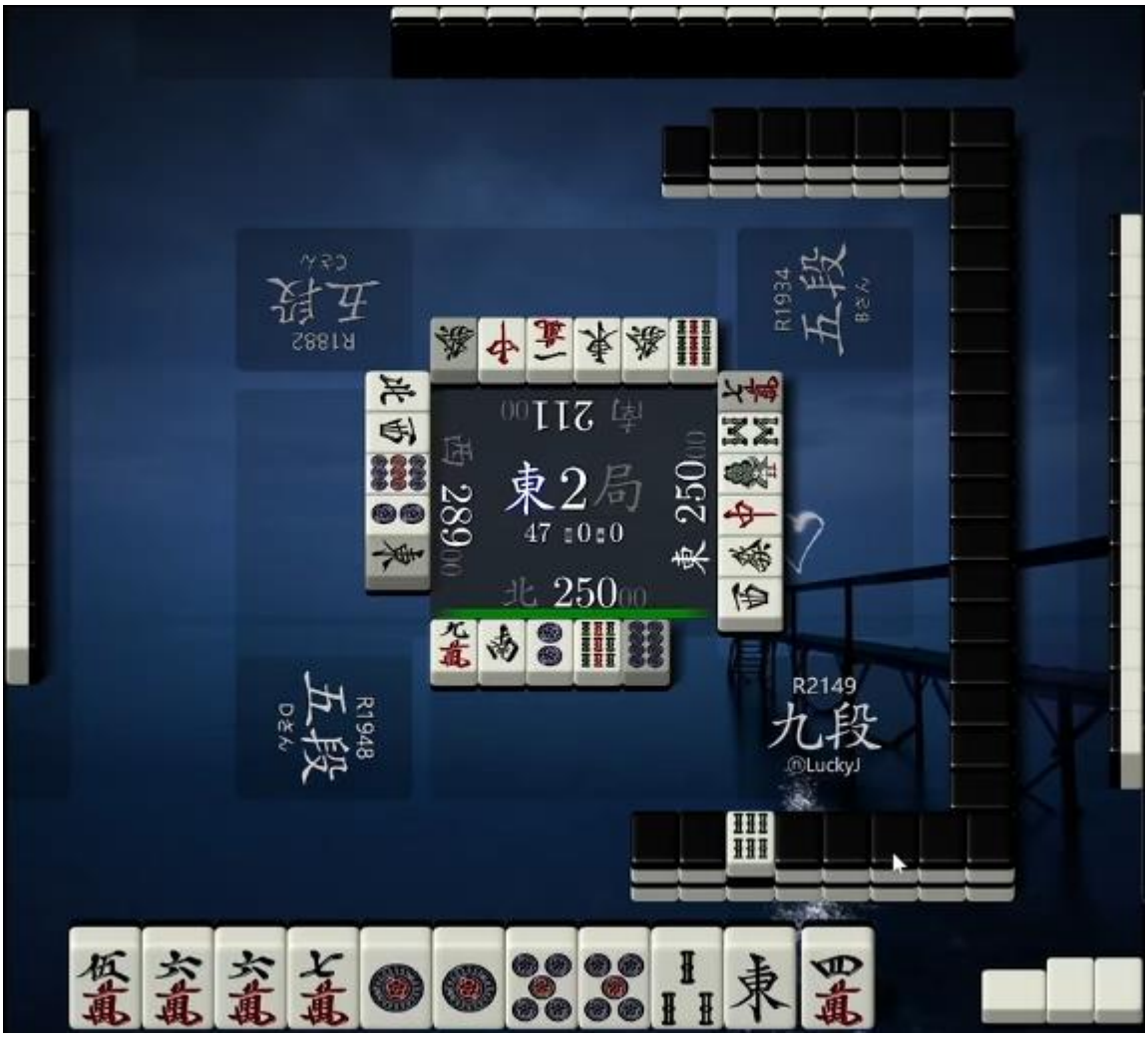
However, despite 3p acceptance being fully effective, drawing it still doesn't make 1p the next discard due to the hand's abundance of other floating tiles. This means the hand space argument for treating 2p as a floating tile still applies.

Consider the two possible ways this hand can develop. If it never gains a third White Dragon, it must be closed, where chiitoi contributes significantly to its total value. If this is the case, 2p would be the discard, being a non-terminal, non-honor floating tile with poor potential to grow horizontally. If the hand gains White Dragon at some point, then 11p, being able to pon from anyone, is a good shape, and doesn't need 2p to reinforce it.

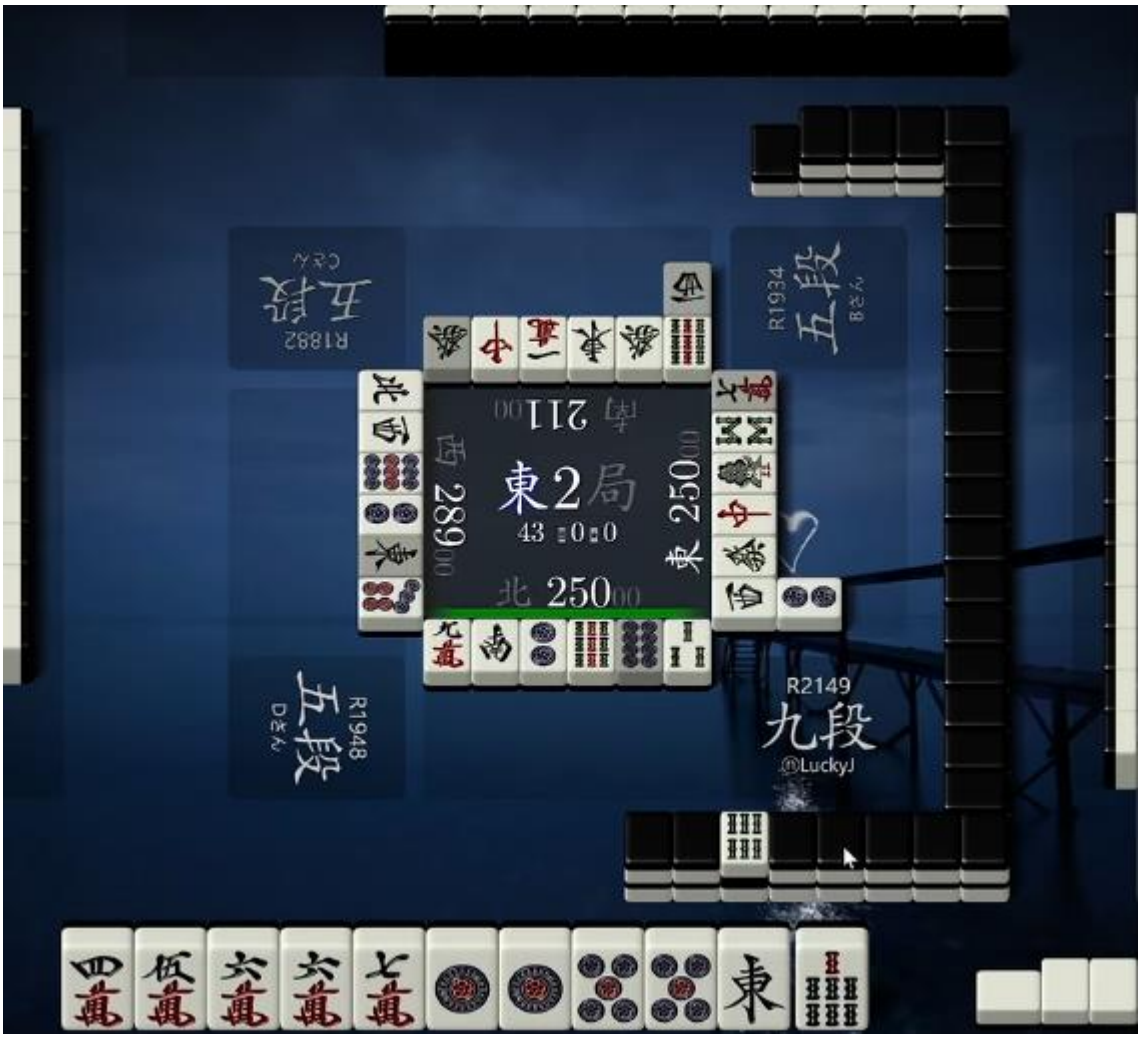
The other floating tiles in this hand all have some advantage over 2p. 3s has greater horizontal acceptance, 9s accepts dora and is a better pair candidate, and East is safe and an excellent pair candidate. The robot **discards 2p** after all. This can also be thought of as fixing the 11p good shape to keep better floating tiles to form a fifth block.



Since this hand has very fast open shape, the robot **calls pon and discards 9s**. With the hand open, 9s being a pair candidate no longer matters, and accepting a single 7s to raise the hand's value from 1000 to 2000 is not worth the bad wait and potential danger from keeping 9s too long.



Upon gaining its fifth block, the robot **discards 3s** to accept its final shape and keep a safe tile.



Even though 7s is worth points, when it's 1 to 2 han, it's not enough points to matter. The robot **discards 7s**.

The robot **calls pon and discards East**, successfully reaching good shape tenpai.

The hand ends with the robot’s 1000-point win.

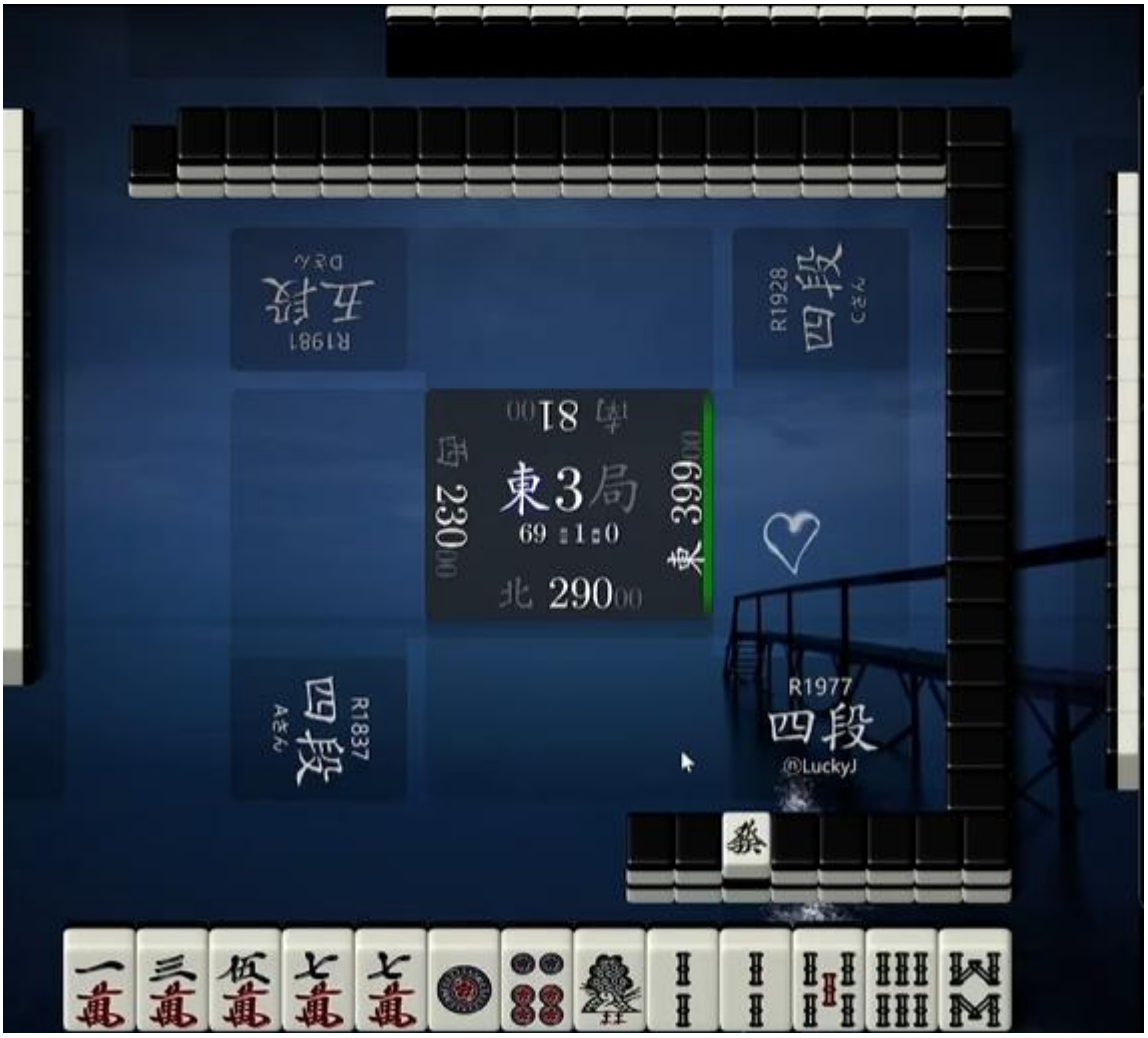
Closing

This episode showcased yet more tools to approach mahjong's hardest hand to play correctly, a 3-away regular shape with four pairs, one of the pairs being yakuhai. This time, the main technique used is reading ahead. That is, picturing various ways the hand could evolve and the importance of a tile in each such way. In this case, both main paths coincided in the same discard, making an initially difficult decision easy.

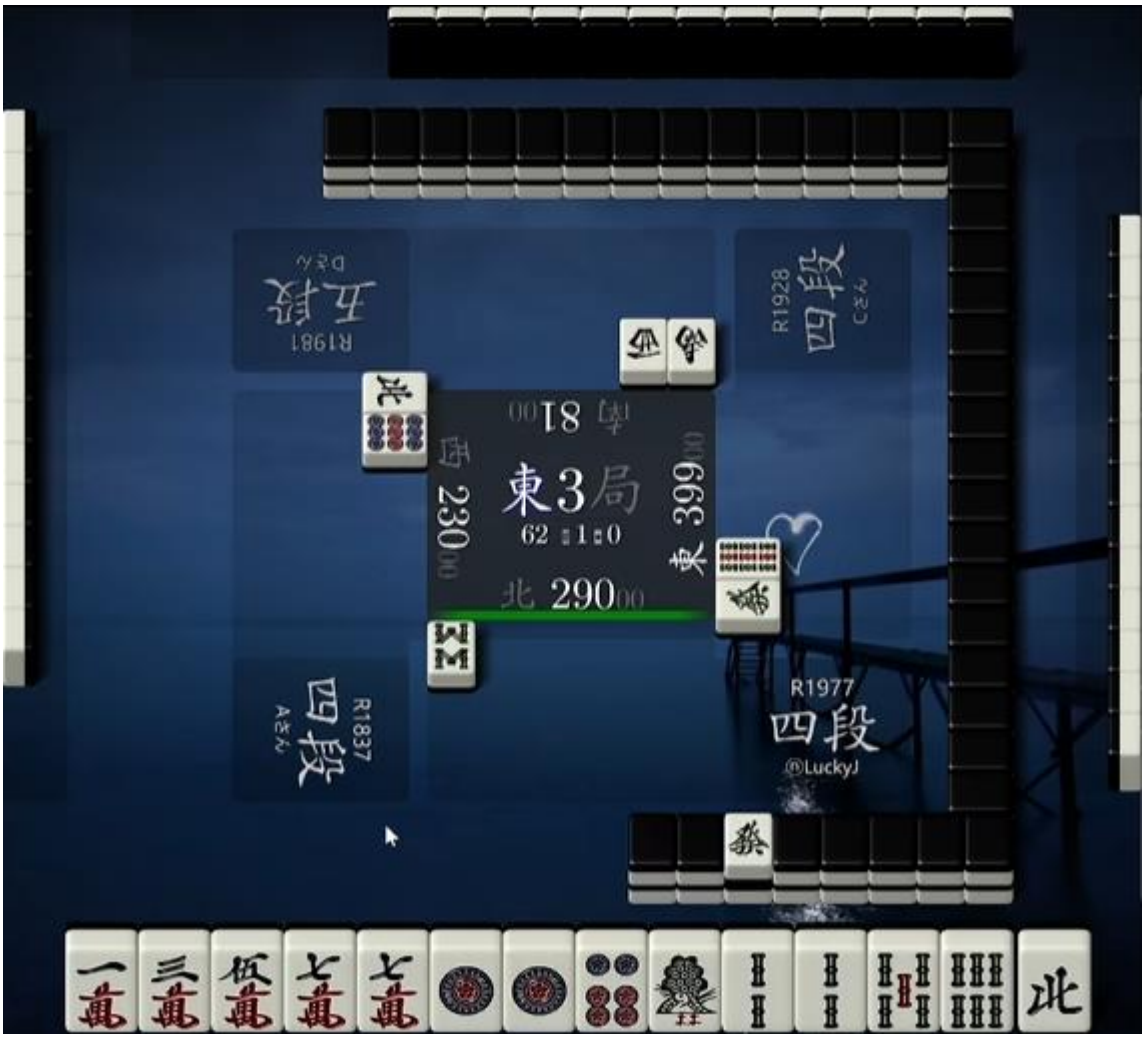
Another important lesson is that ryanmen is not the only good shape, and how opening a hand changes the speeds of shapes. A closed ryanmen has 8 effective tiles, while an open shanpon has 4, roughly multiplied by 4 for being able to get them from any player. This is effectively 16 tiles of acceptance, the same as a ryanmen that can chii. Even if only one side of the shanpon can pon, that's still effectively 10 tiles, more than a closed ryanmen. This drastic change in effective acceptance means open hands have very different priorities than closed ones.

Additional strategic points for this hand include the irrelevance of improving value from 1 to 2 han, treating complex extensions as floating tiles when lacking a block, and treating shapes like 112 as a pair and a floating 2 when chiitoi chance is significant. Together, they make studying this hand, and others like it, a great way to improve at this game.

Hand 17



East 3, second place, with about a mangan gap to both first and third. The only strategy adjustment for this score is being slightly less willing to push against last place.

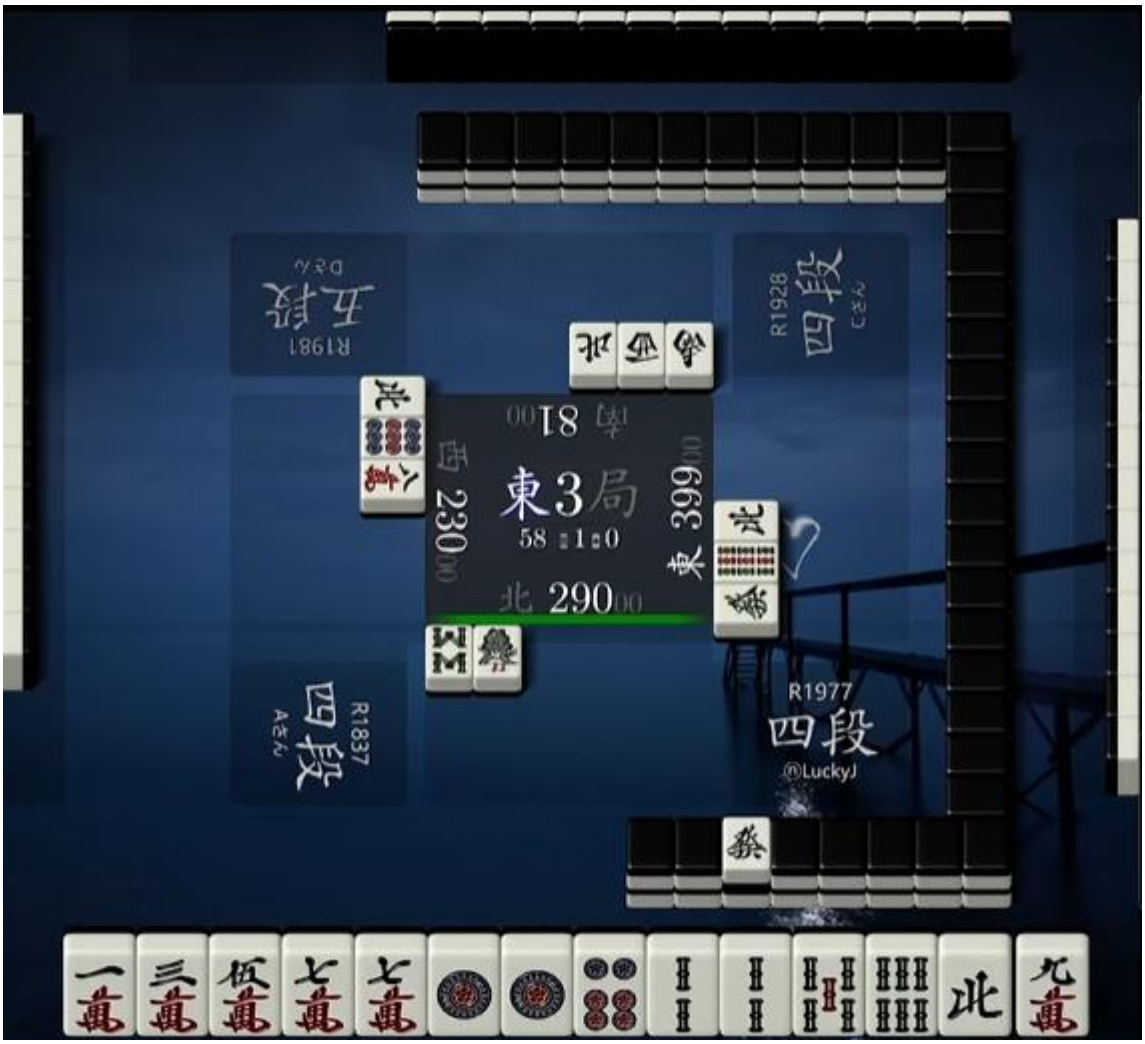


This hand has five blocks total, four blocks for tanyao, three pairs, one good shape, and no dora. Despite having five blocks so early, it is not a good hand, lacking both shape and value.

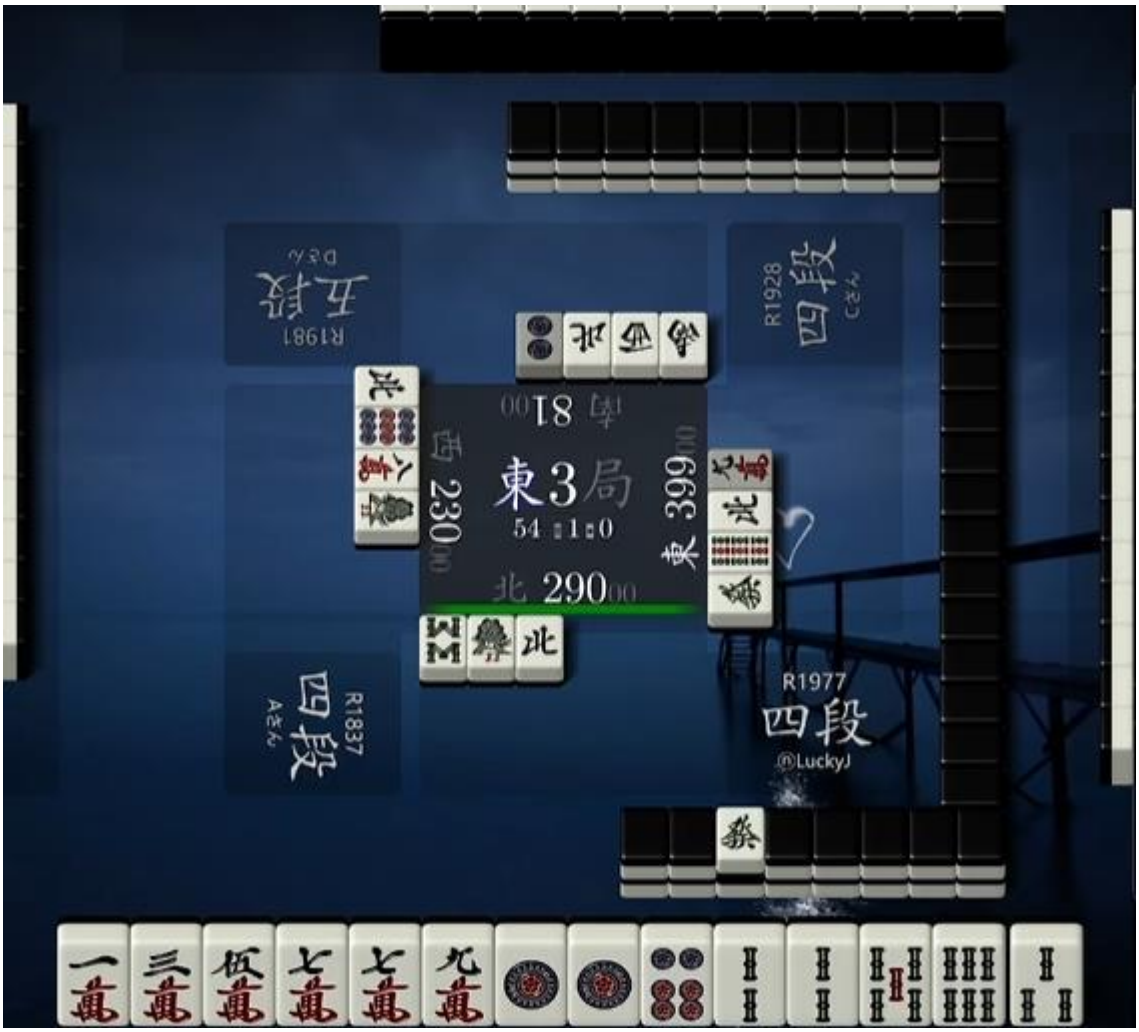
There is potential for this hand to improve on both fronts. For speed, pairing and calling pon on North or gaining a fifth bock for tanyao allows the hand to open. For value, chiitoi is viable with three pairs and only one good shape.

With one good shape, gaining an effective tile towards regular shape makes regular shape strong enough to abandon chiitoi. But until this gain is made, North should be kept as it serves triple duty as a pair candidate, potential yakuhai pon, and safe tile. 6p is the hand's best hope at a fifth tanyao block and should be kept too.

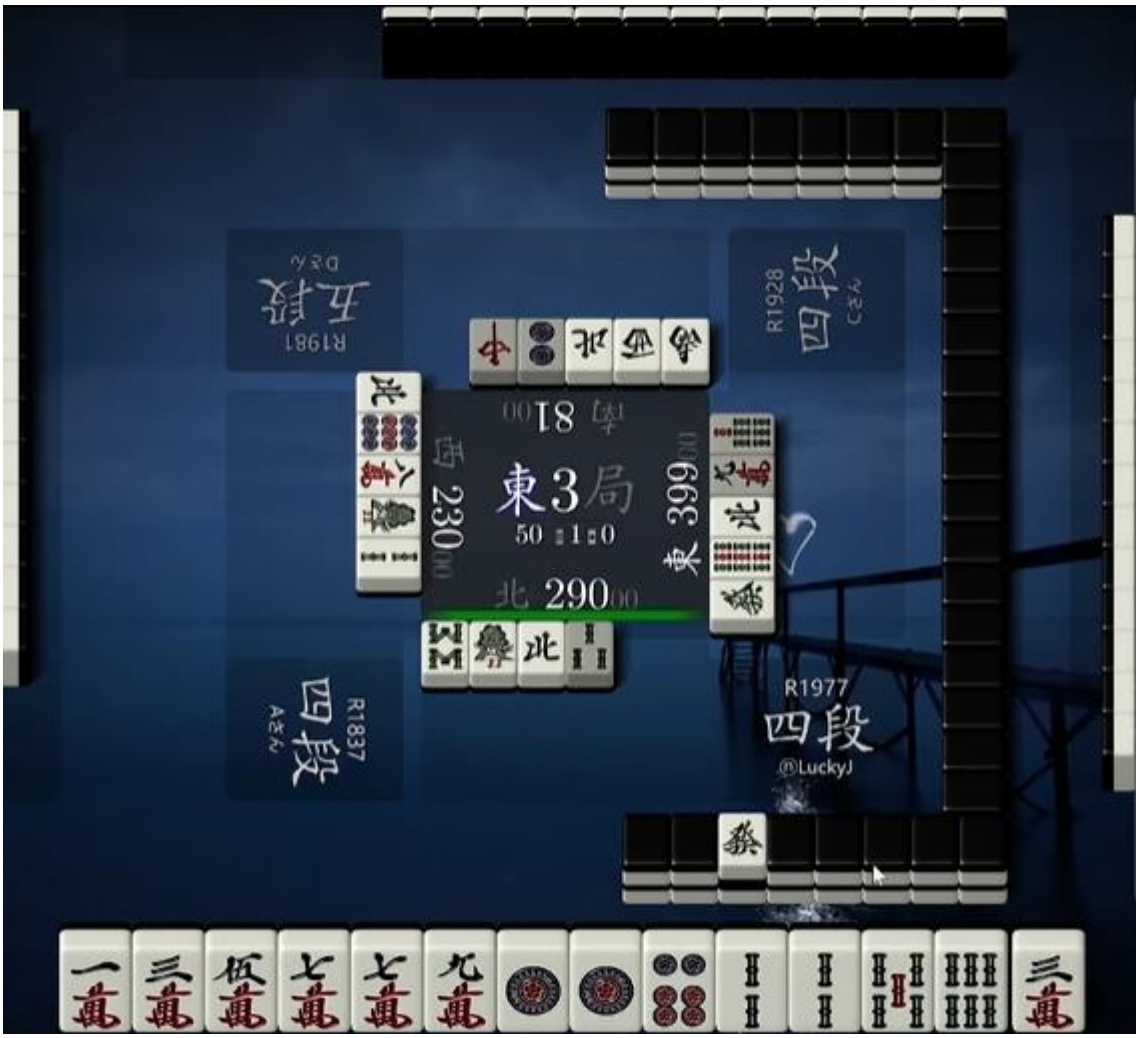
Out of all other regular shape acceptance, 2m and 3s are the least valuable as they lose tanyao. The robot **discards 1s** because it only loses 3s acceptance, compared to 1m which also loses 6m.



North is now a dead honor. Although 9m is similar to 1s last turn in that it only enables non-tanyao acceptance, this is still better than North that just lost two out of its three benefits. The robot **discards North**.



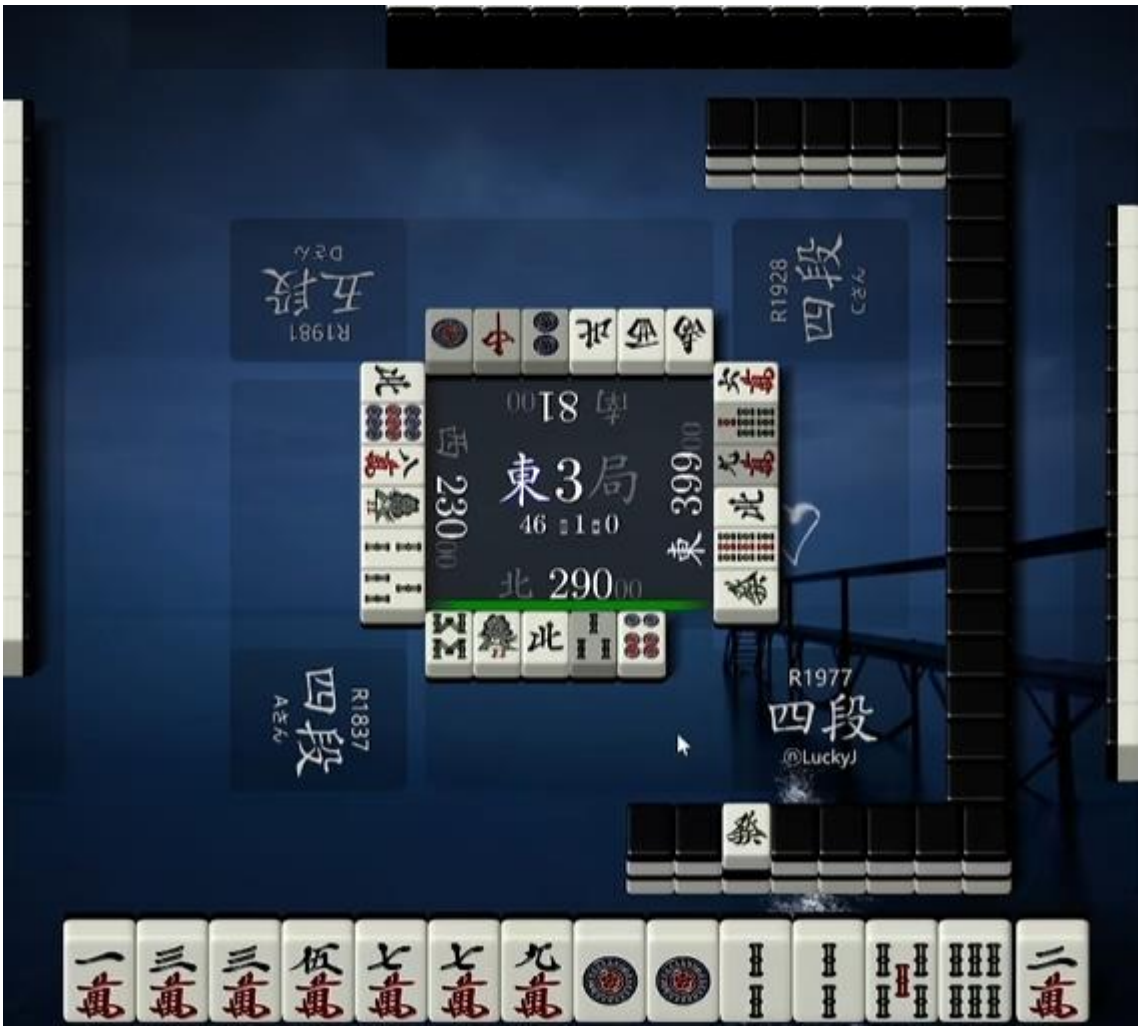
Although 3s forms a ryanmen with 22s, it's not much of a good shape when 1s is twice seen and furiten and 56s already accepts 4s. Since 6p is still a valuable tanyao block candidate, the robot **discards 3s**.



Upon drawing a fourth pair, considering 6p is still a tanyao block candidate, it's natural to continue hedging tanyao and chiitoi by discarding 1m or 9m. However, tanyao is now 1000-point 3-away compared to valuable 2-away for chiitoi. Even if the hand draws 5p or 7p next, it would still be unreasonable to break 11p for tanyao.

Consider what would need to happen for 6p to contribute to this hand. First, it needs to form a block via 4578p draw. Then the hand needs to gain an effective tile towards tanyao before it draws a fifth pair. If the hand draws its fifth pair or any other effective tile towards regular shape before 6p forms a block, 6p will be discarded. Even if 6p forms a block first, if the next effective draw is a fifth pair, 6p still doesn't contribute.

All things considered, the valuable possibility of chiitoi leads to a far lower chance of the hand keeping and using 6p. This lowers the value of 6p enough that it no longer beats 1m and 9m, which provide direct acceptance, are safer, and are better pair candidates. The robot **discards 6p**.



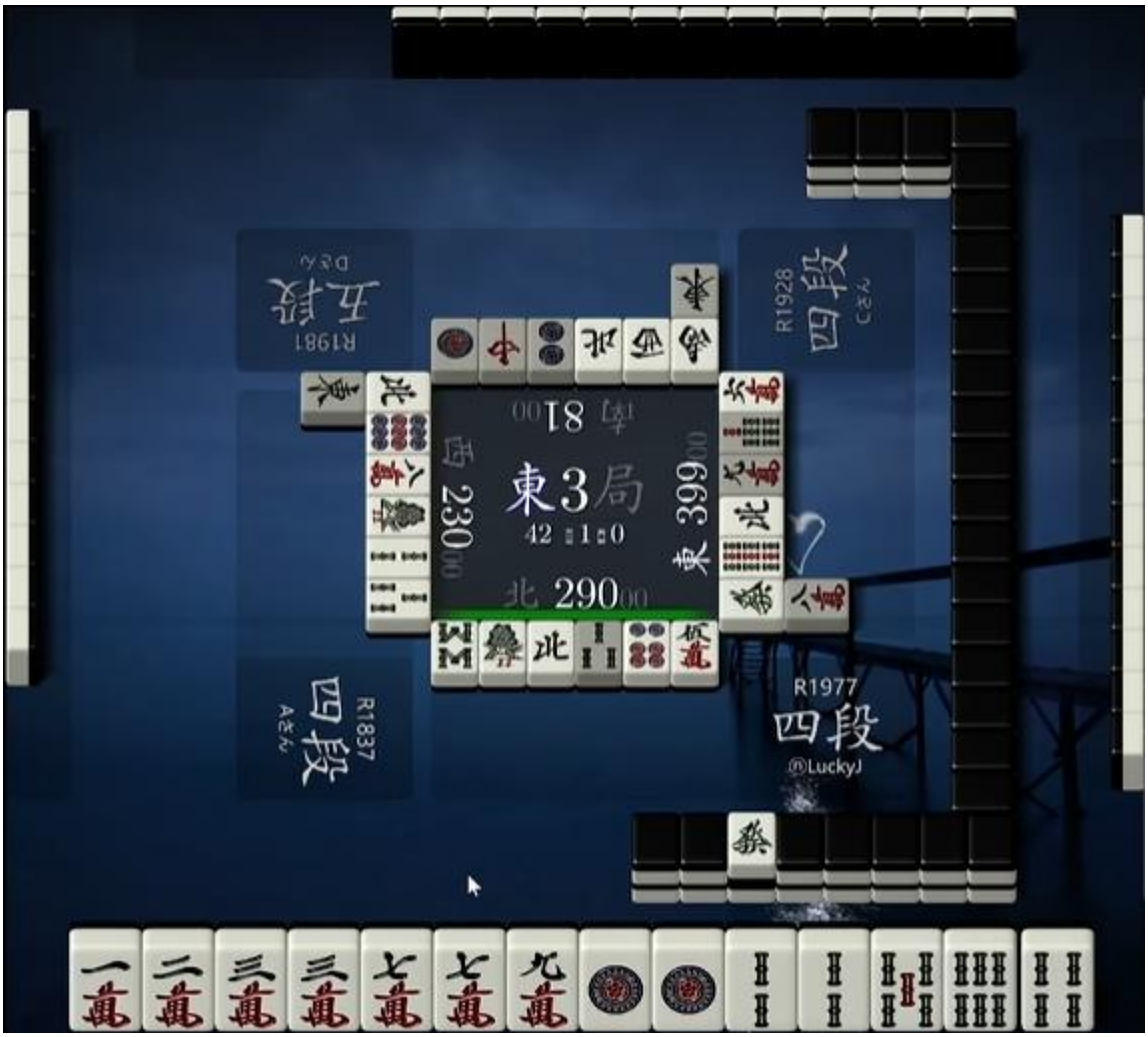
With the player across discarding dora and left-hand opponent breaking a whole sequence a turn later, it is now necessary to consider safety.

The 2m draw advances regular shape to 2-away, the same as chiitoi. Since all pairs, completed shapes, and good shapes need to be kept, the only discard candidates are 5m and 9m.

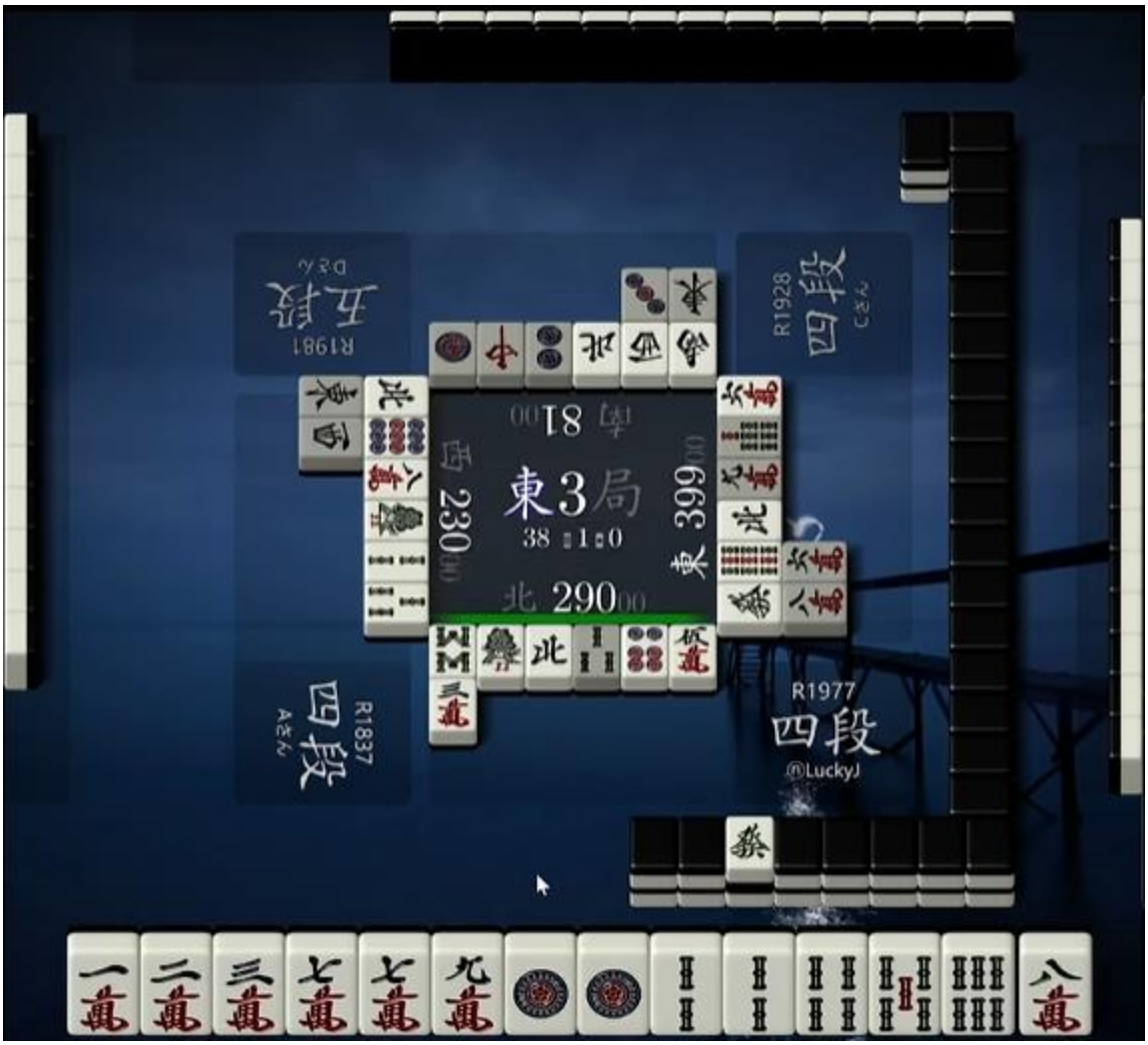
5m provides ten total tiles of acceptance in 456m. 9m accepts five, 89m. If acceptance were the only priority, 9m would be the discard. But there are other relevant factors influencing this decision.

Firstly, 456m are less likely to be in the wall than 89m, weakening 5m's advantage in acceptance. Secondly, 1p and 2s are both depleted. This makes achieving a good wait with regular shape less likely, weakening the effect of regular shape acceptance. Thirdly, 9m is both a better pair candidate for chiitoi and a safer tile against two players.

All these factors in favor of 9m reverse the two tiles' importance. The robot **discards 5m**.



The hand reaches 1-away for regular shape. Without any spare tiles to keep both regular shape and chiitoi options open, the robot **discards 3m** and abandons chiitoi.



Although this wait is only 2 tiles wide, and although it's only a 1300-point hand, the robot still **declares riichi discarding 7m**. With no one having made a move, a reasonably early turn, not many ways to improve the hand, and a sotogawa trap on 2s, it's a clear decision despite the drawbacks.

The rest of the hand is omitted as there are no decisions to make after riichi.

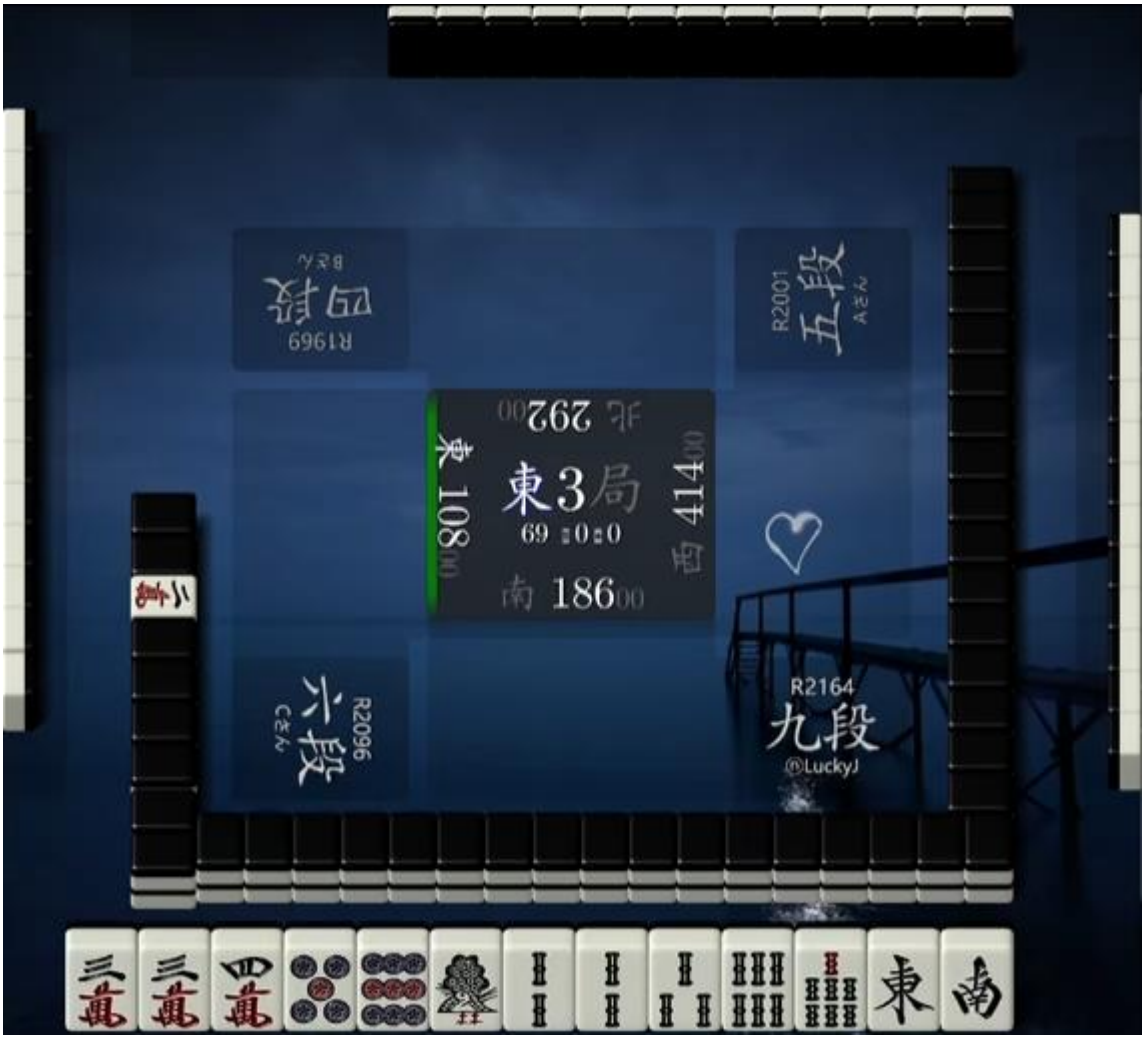
Closing

The key play this round was the 5m discard on turn 6. It is an example of a “safety hedge”, a way to keep safer tiles that doesn’t compromise efficiency as much as keeping 100% safe tiles like dead honors. This technique is often used when approaching the midgame with a hand that is too weak to go full attack yet is too strong to simply hoard honors and fold. In this case, it was combined with wall reading and value considerations to reach the final answer.

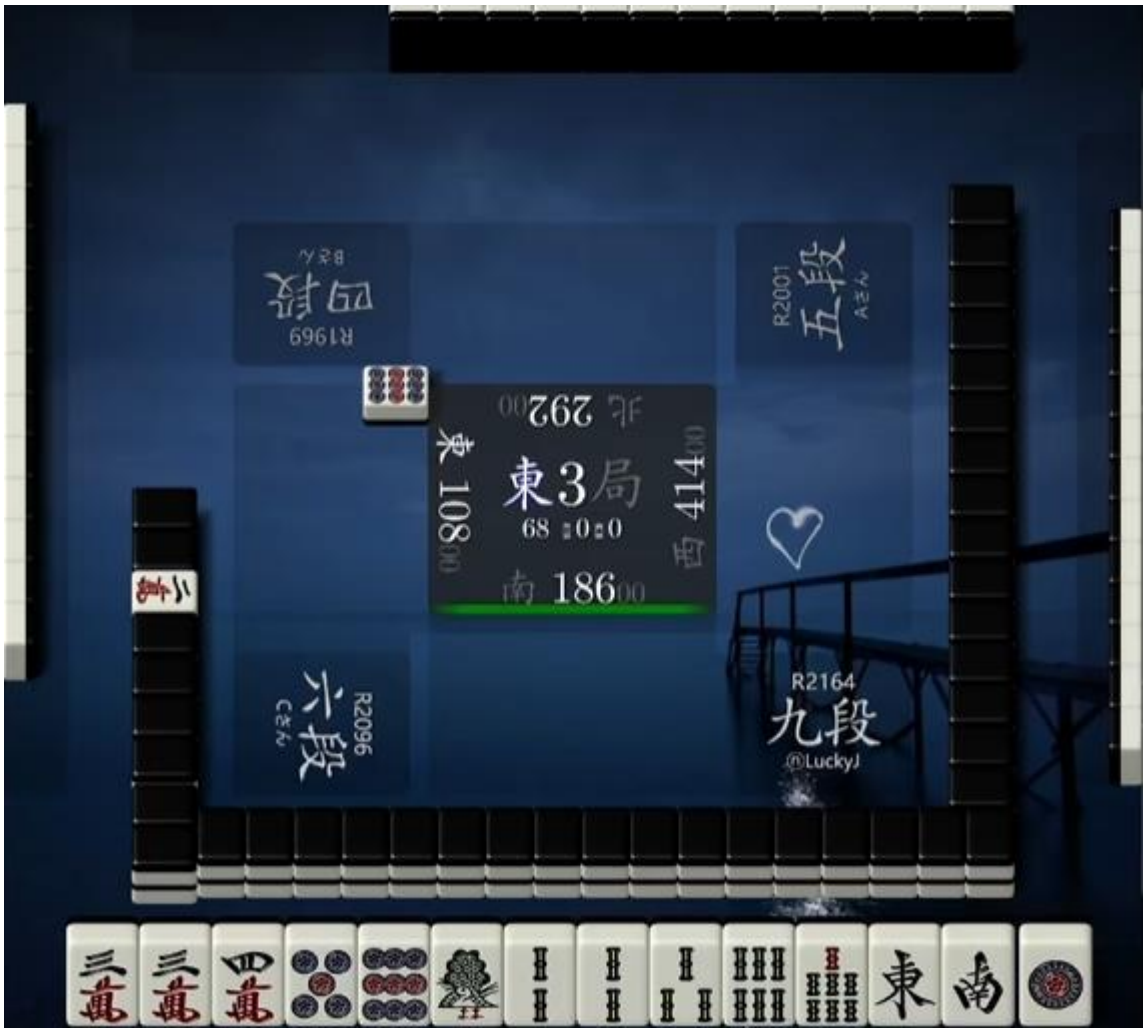
Another heavily used strategy principle this hand was combining chances. Like with many mediocre hands, the robot began this hand by keeping the possibility open for both regular shape and chiitoi, only committing to regular shape when it became impossible to go for both. The turn 2 discard of 1s, keeping both North and 6p to develop in either direction, exemplifies this strategy.

Finally, it’s worth mentioning just how strong first move riichi is, to the point where it’s the right move even when waiting on 2 tiles with minimal value, in a score situation where a cheap win does not improve placement. This means despite all discussions of advanced strategy, efficiency is still king, and racing to riichi before anyone else is still the primary goal for most hands.

Hand 18



East 3, third place. Regardless of score situation, a hand with decent shape and 2 dora should be played as fast as possible in the early game.

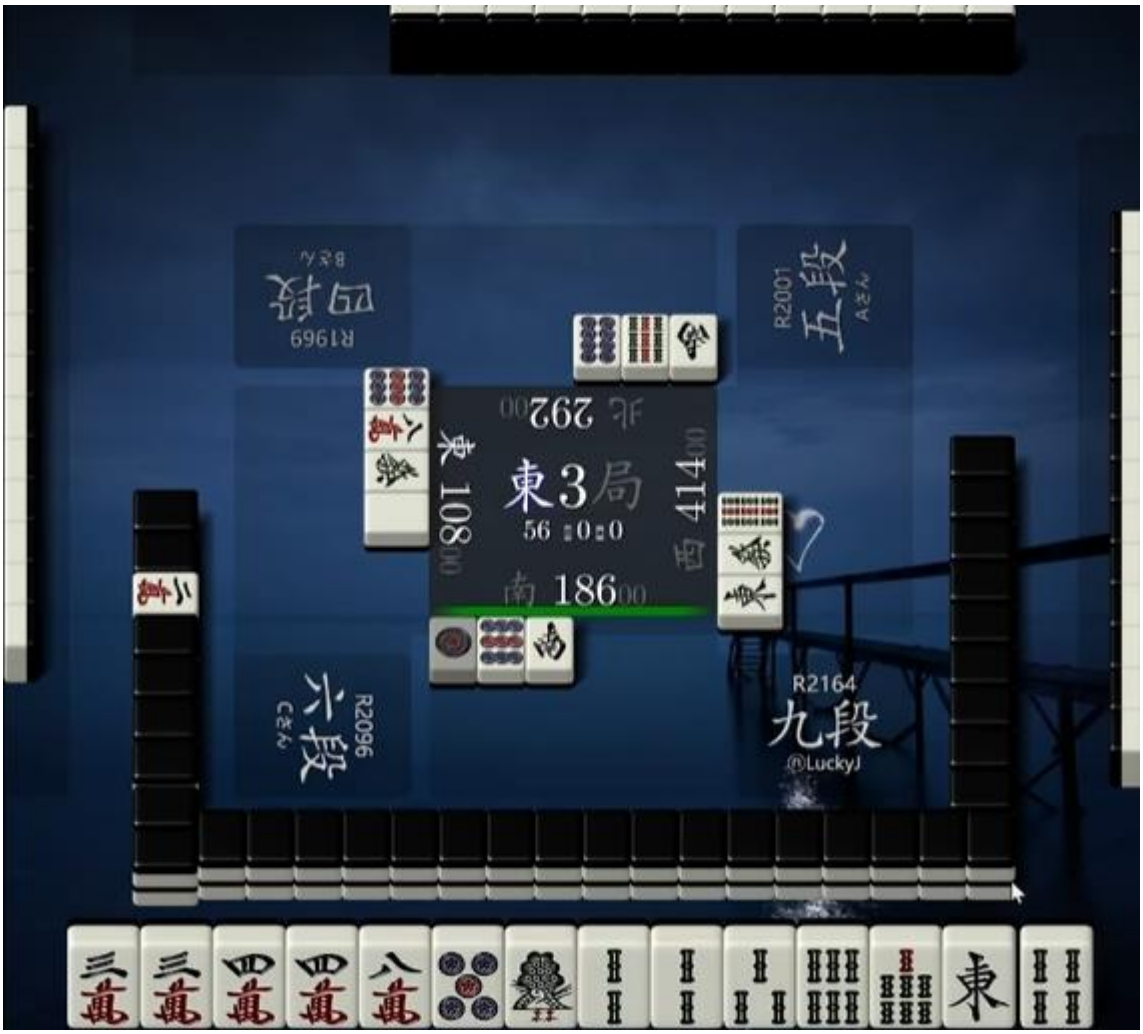


Since 9p has been discarded by dealer, it is both slightly safer and tiles around it should be slightly richer in the wall than those around 1p. The robot **discards 1p**.

Naga would discard East here, foregoing the possible 3-han open yakuhai hand for maximum closed efficiency, including the ability to form a pinfu-eligible head with 1p or 9p. Discarding yakuhai early also reduces the chance of someone calling pon on them, lowering the average speed of the round, which is beneficial to a somewhat heavy hand like this one.

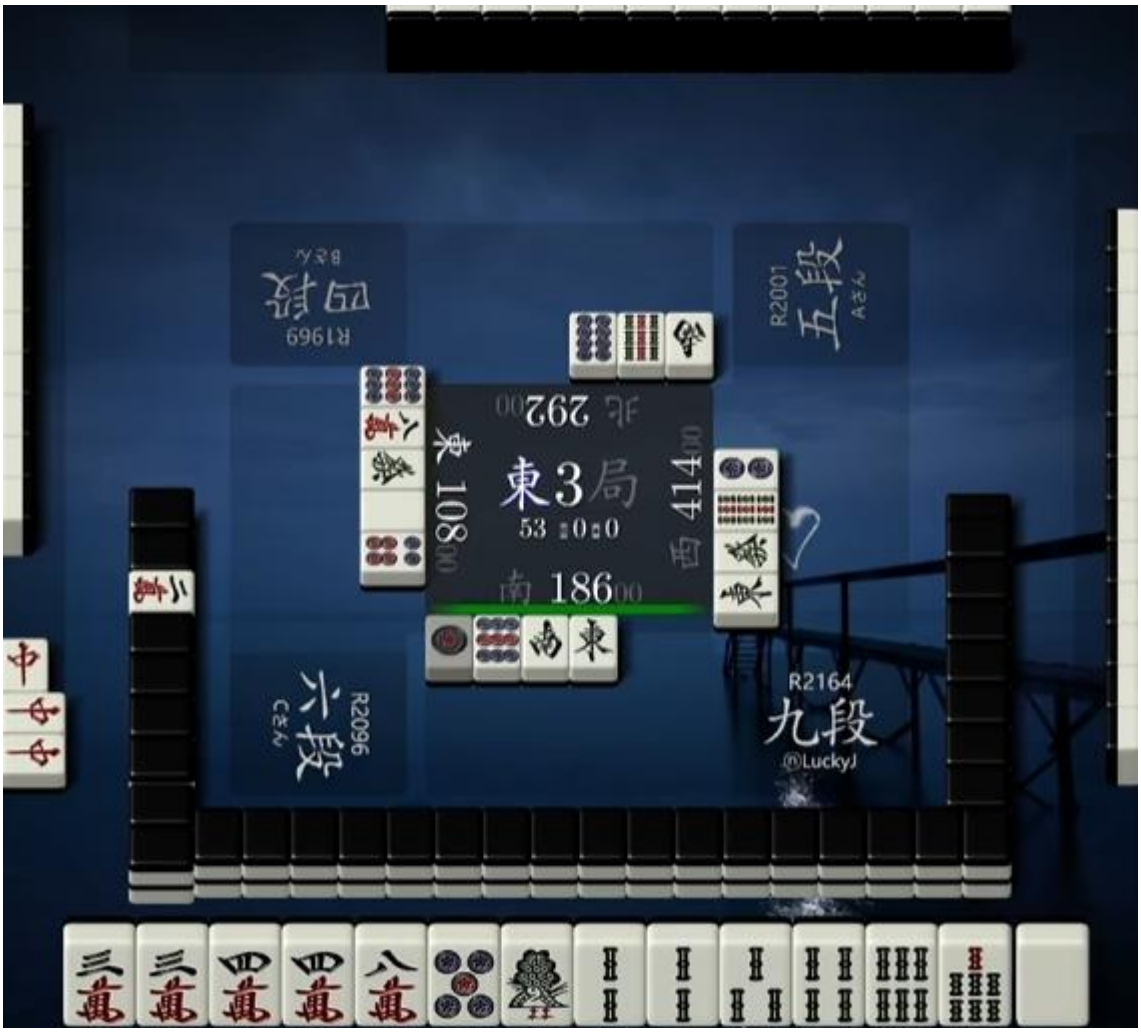
It is hard to definitively conclude which discard is better. The best interpretation is that choices like this are a matter of style.

The robot **discards South**, technically a slight error. This is intentional as the robot randomizes its decisions to make itself harder to read (if it always discards East here, people will know it never has East when it discards South, which can be exploited). Plays like this are not significant for learning strategy from robot play.



Drawing 4s advances the hand to 2-away. The discard candidates are East to maximize closed efficiency or 1s to maximize open speed by combining chances between tanyao and yakuhai.

Discarding 1s exacerbates the overlapping 5s acceptance in souzu as it loses a lot of acceptance in the same suit, namely 134s. With 2 dora, riichi would raise this hand's value enormously, so it should be the top priority. Losing so much closed acceptance for the possibility of drawing one of two remaining Easts is not a good trade. Therefore, the robot **discards East**.

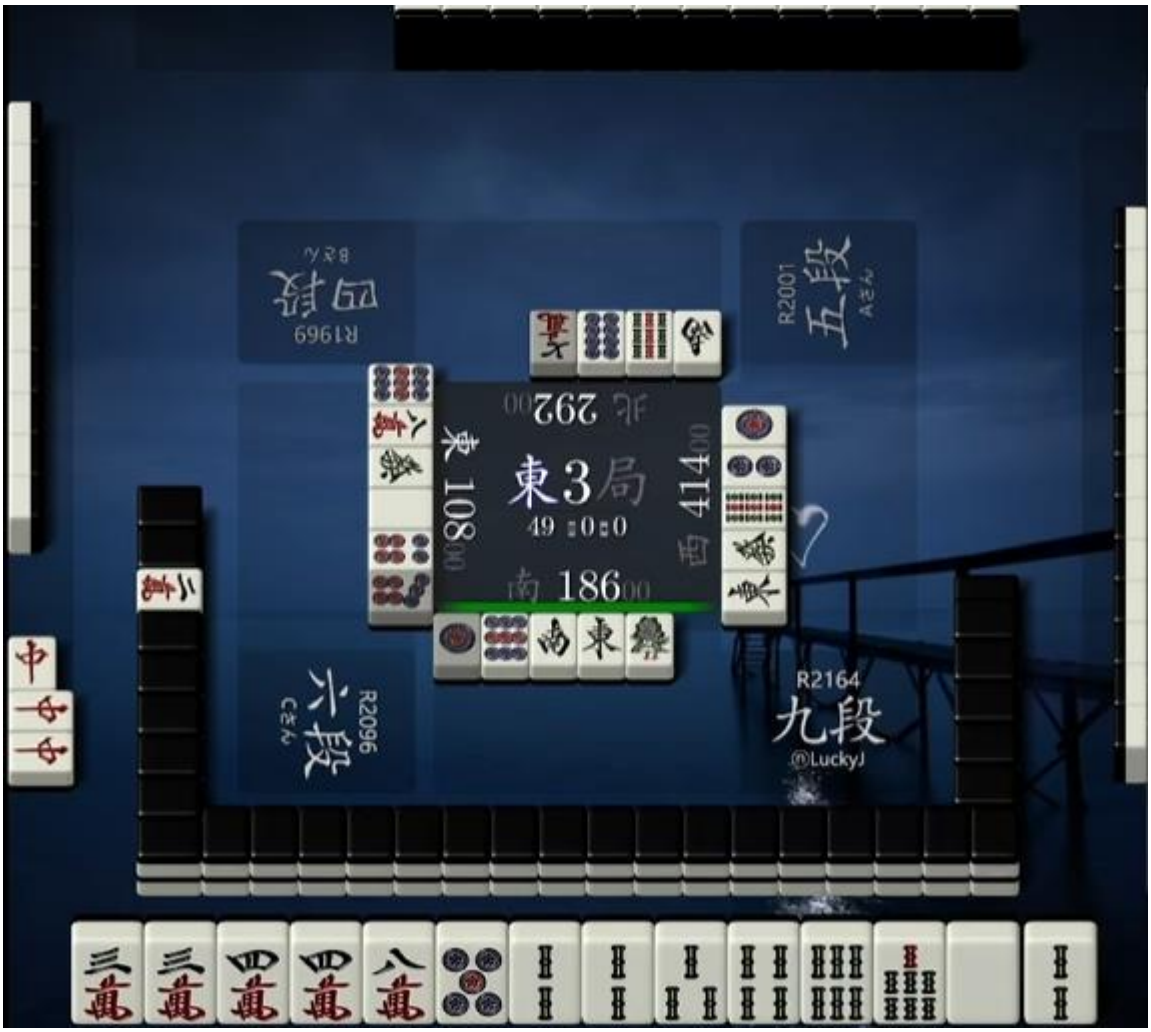


Left-hand opponent pons Red Dragon and discards a middle tile. There's little difference between this White Dragon draw and the East that was just discarded. It would seem the play here is to simply discard it.

However, although this hand didn't change, the situation on the table did. With dealer now open and having discarded a middle tile, this 2-away hand is at risk of falling behind. This raises the value of safe tiles and is also an incentive to increase the variance of the hand's final shape strength. Both strategies enable more counterattacking options later.

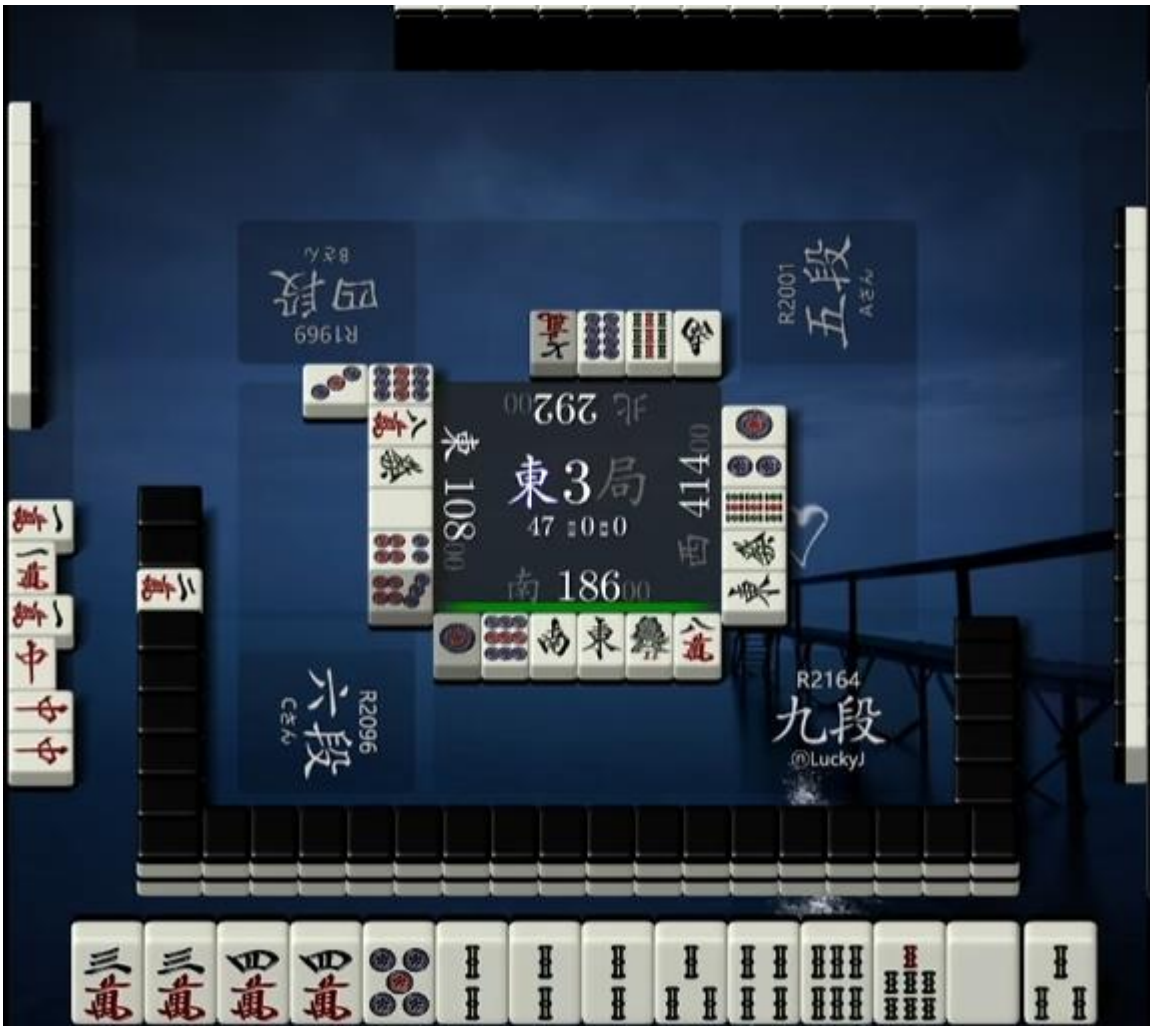
In addition, an opponent racing ahead reduces the value of closed acceptance for riichi in favor of open speed. A fast open win is now not only worth the hand value itself but also value in preventing their win.

All these points combined reverse the importance of 1s and White Dragon. The robot **discards 1s**.



Drawing 2s gives the hand five good blocks, some of which have room for improvement by eliminating overlapping acceptance. 8m can only form a good shape with 7m, and even that would lose guaranteed tanyao, so it is not viable as a potential improvement. Since White Dragon is safer, the robot **discards 8m**.

5p sakigiri, keeping both safe tiles against dealer, is also viable. This, again, is a matter of style.



Dealer calls a second pon. At this stage, while it's possible they're tenpai, it's far from a certainty. With a hand this valuable, strong enough to push even if dealer is tenpai, sakigiri to strengthen this expected future counterattack is standard. The robot **discards 5p**, foregoing the possibility of using it to improve its shape. At this stage, any such improvement would take too many turns to affect the game before dealer wins the hand.

Dealer calls another chii and discards red 5m. They're virtually guaranteed to be tenpai. With guaranteed good wait mangan 1-away, the robot of course **calls chii and discards White Dragon** to push.

Naga disagrees with this play and would chii then discard 3s or 4s (depending on Naga version), with 3s, 4s, and White Dragon all given significant confidence percentage. Mortal agrees with White Dragon with over 90% confidence.

It's clearly unwise to sakigiri with an opponent in tenpai. The only reason to do so is for a stronger push against more than one opponent later, but neither remaining opponent looks fast enough for that to be likely. In this case, Naga's play is wrong and should not be learned from.

Dealer wins by tsumo before the robot can reach tenpai, meaning it never had to risk 3s or 4s.

Dealer was very cheap, but this can’t be known before their hand was turned face-up.

Closing

The key learning moment in this round was the East discard on turn 4 in contrast to the 1s discard on turn 5. With a virtually identical hand, the robot made two different decisions on consecutive turns based on what its opponents were doing. Most of the reasons for doing so are easy to understand, such as saving safe tiles and being more willing to open. The point about “increasing the variance of the hand’s final shape strength” deserves elaboration.

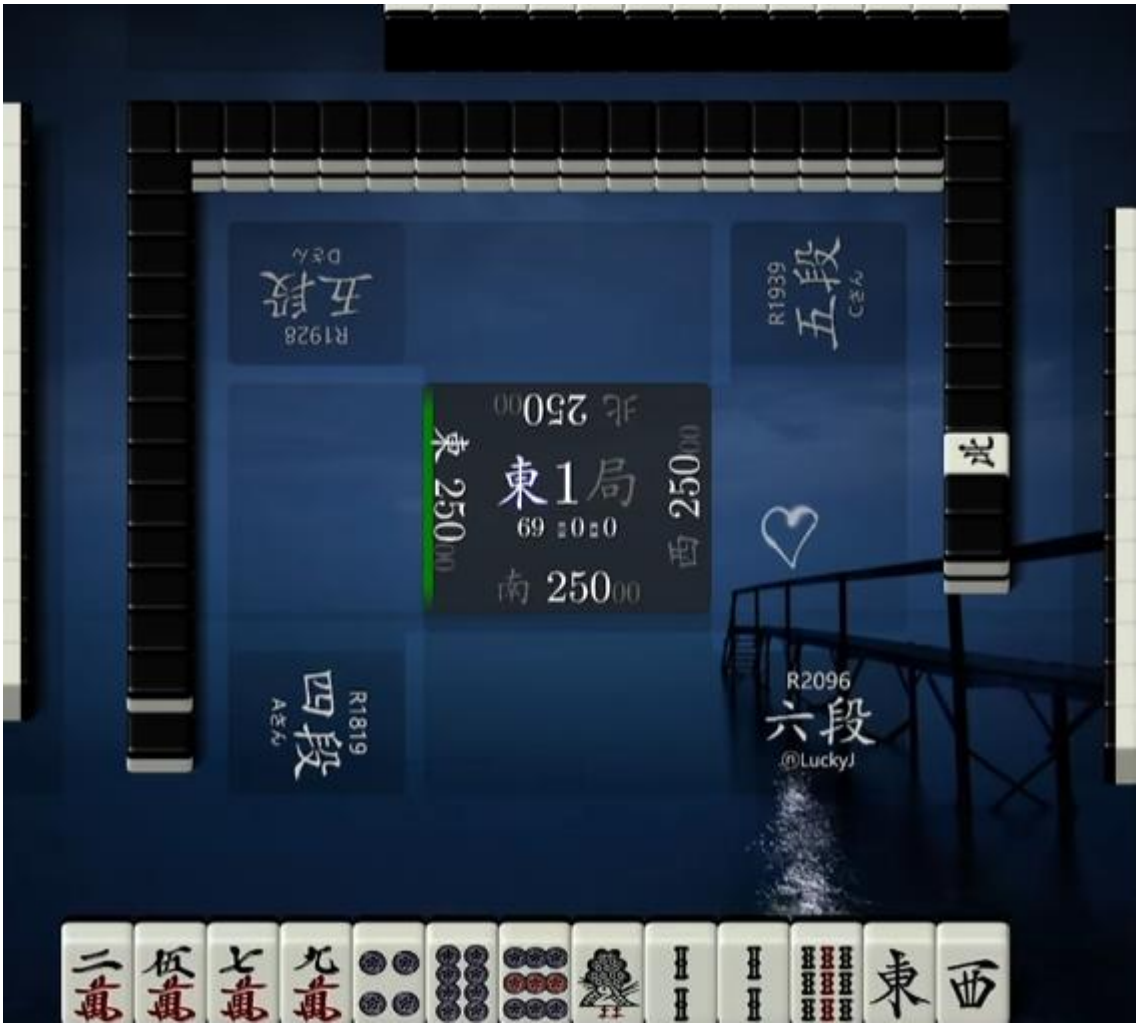
When a hand is far from tenpai, there’s multiple paths to develop it. Often, one path will lead to key accepted tiles with far higher value and/or speed than others, while another path has accepted tiles that are relatively equal in value. Examples of the first type of hand include but are not limited to dora yakuhai pair waiting for pon, atozuke in general, one-sided sanshoku or ittsuu, and chiitoi with dora as a pair candidate. The second type of hand is the more typical closed, tanyao-pinfu regular shape hand waiting to riichi, which will most likely be 2 or 3 han no matter which tiles it gains to get there.

The strategy theory invoked here is that the first type of hand, with high variance, gets better the more likely a counterattacking decision is to arise later. This is because with such a hand, it is obvious whether to push or fold when the decision comes. Either it has gained its key tile(s) and should push, or it has not and should fold. In contrast, the second type of hand has far less obvious push/fold decisions. This principle is not only useful against open hands but against any opponent showing signs of strength, like those discarding middle tiles before outside ones early.

Another important note is how fallible robots are. Aside from mistakes caused by deliberate randomization like discarding yakuhai out of order, a robot as strong as Naga can even make obvious blunders like trying to sakigiri against an opponent obviously in tenpai. This doesn’t mean robots are useless, but rather means their outputs must be interpreted and analyzed with as much care and rigor as human opinions, not trusted blindly.

Finally, some decisions really have no right answer and come down to style. Mahjong is far from being as solved as chess, and there are currently multiple top players, human and robot, in person and online, with vastly different approaches to the game who all win a lot. Rather than copy the style of a winning player, it’s more rewarding, not to mention fun, to find your own.

Hand 19



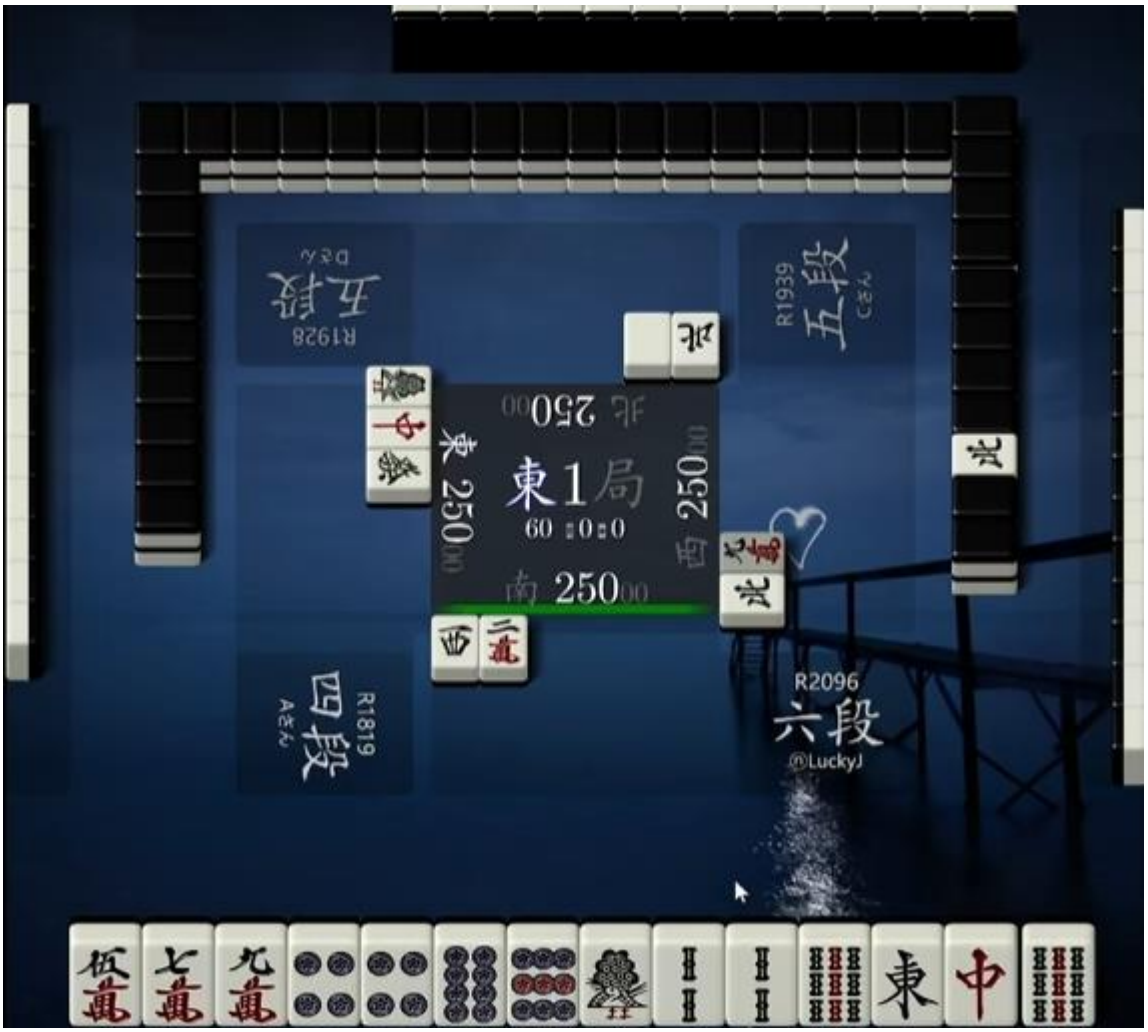
No strategy adjustments for the first round of the match, of course.

This hand has horrible shape. Its only highlight is a single dora yakuhai. On the first turn, the robot naturally **discards West**.

Conventional wisdom states that suji 2 or 8 is a stronger floating tile than isolated 1 or 9. However, in terms of forming a sequence, a suji 2 needs to gain exactly 1 and 3 (3 and 4 is covered by 5) while an isolated 1 needs exactly 2 and 3. This means both tiles are as fast as each other at forming a sequence.

Suji 2 is better for its ability to form a good shape, tanyao, and pinfu. Isolated 1 is better for safety and being easier to pair. Depending on how important each of these considerations is, one or the other may be better to keep in any given situation. It would be a mistake to always discard one or the other without thought.

In this position, 5m is part of a block, so 2m is stronger than a usual suji 2 because drawing 6m upgrades it to isolated. 9s is also stronger than a usual isolated 9 because there's a distant hope for 789 sanshoku. With such a terrible hand, the abilities to both open and defend are paramount, making 9s the better tile here. The robot **discards 2m**. Red Dragon is kept for the same reasons.



The hand gains its fifth block and third pair. However, with no good shapes, staying closed for regular shape riichi is not viable. Even with perfect draws, the best result for doing so is a bad wait riichi with no extra value.

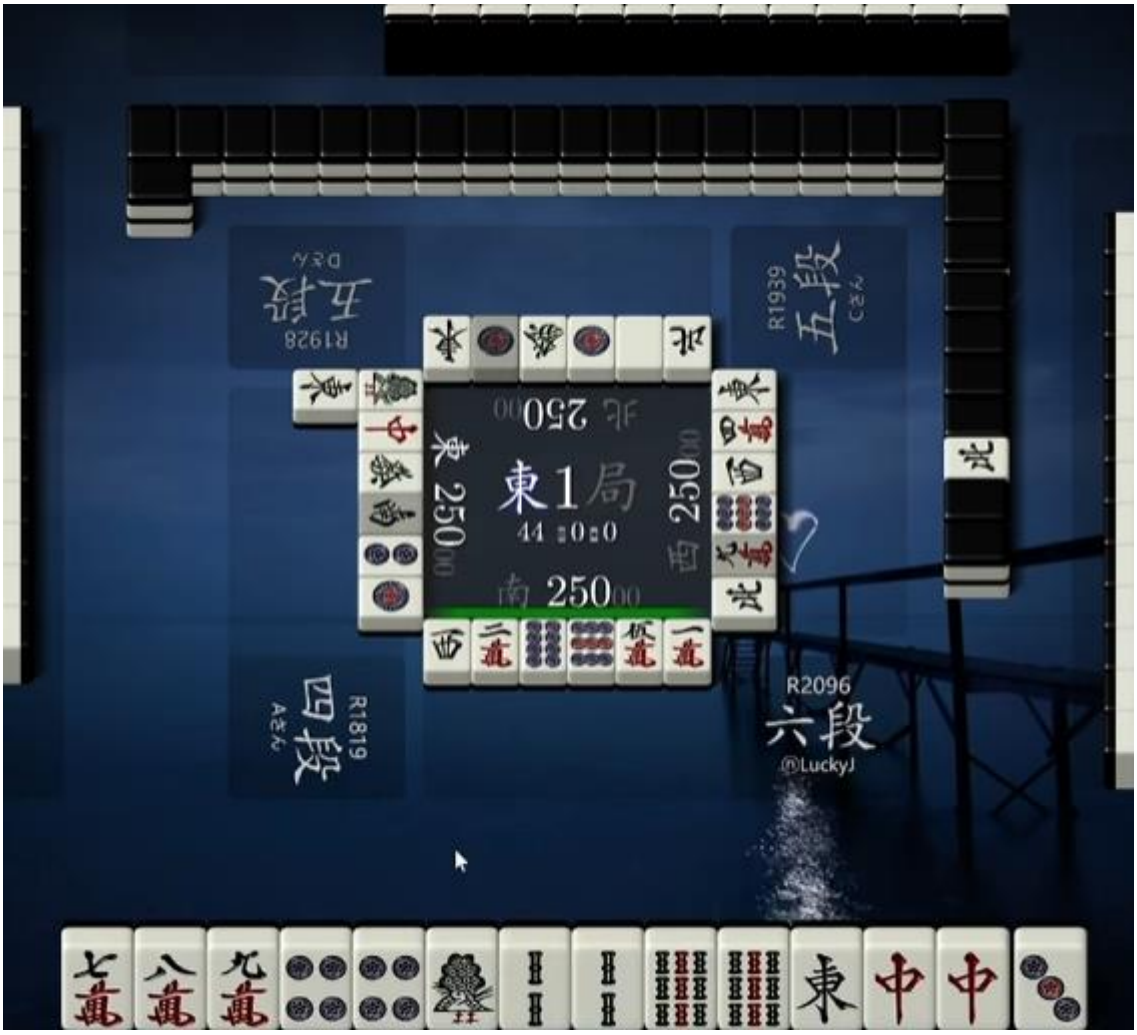
Since it is unviable to use the hand's existing five blocks to riichi, it's not much of a loss to break its worst block, 89p. Doing so allows the hand to keep Red Dragon, which offers three tangible benefits in safety, chiitoi, and pairing it to open. In addition, if Red Dragon is discarded here, the hand becomes short on space. Upon drawing another effective tile, it will face the difficult decision of whether to keep East. Breaking 89p avoids this conundrum, letting the hand maintain its jackpot draw of a second East for longer. The robot **discards 8p** based on this reasoning.

Naga would discard 5m here, acknowledging the unviability of regular shape riichi in a different way by committing to chanta as a main direction. By doing so, its best draw is still pairing yakuhai, but that would result in the hand having six blocks and facing a difficult choice of which one to break, without a good floating 5m to improve its shape.

This is a style difference between the two robots. All things considered, discarding 5m and 8p result in similar hands with mostly identical acceptance. 8p is better for making future turns easier to play, safety, and possible shape improvements. 5m clogs the hand with excess blocks, making future decisions harder, but is faster with its open chanta option and has a greater chance to end up with a single wait on an honor. Both plays have enough merit to be called correct.

The lucky Red Dragon draw came last turn. In this position, the robot **discards 5m** over the natural 1m. This is a hedge for chiitoi and safety. It's getting close to midgame, and despite some lucky draws, the hand is still not fast and can easily end up behind. If the hand needs to play from behind, it will much rather have 1m than 5m floating and would rather pursue chiitoi than needing to open.

Of course, there's nothing wrong with discarding 1m to keep 6m effective. Setting up a suji trap softens the blow of losing four effective tiles, but the loss is still significant. If 5m is a better discard than 1m, it's better by only a little bit. This kind of play, while eye-opening, is low on the list of what to learn from robots.



Since the hand can open, non-middle pairs can be considered good shapes. This means the 3p draw gives the hand five good blocks.

Since it's now the midgame, the hand must plan for what to do when facing a riichi. If an opponent declares riichi, it makes a big difference whether the hand contains a defensive liability. A few extra effective tiles are no use if the whole hand needs to be broken to defend. The robot **discards 4p**, foregoing chiitoi and some acceptance to keep a safe tile.

Upon reaching 1-away, all effective tiles are too valuable to give up. The robot **discards East**, giving up its safe tile for maximum acceptance.

The robot **calls pon and discards 1s** to wait on Red Dragon. Since the Red Dragon pair is also safe, there's almost no chance of dealing in.

The robot scores a 1000-point win.

Revealing the hands shows that this 1000-point win stopped right-hand opponent's mangan. Given how poorly this hand started, one couldn't ask for a better result.

Closing

This hand is another example of the adage that the worse a starting hand, the more carefully it must be played. Playing poor hands correctly is what separates intermediate and "merely good" players from great players. Everyone can play an all-good shape, turn 5 good wait mangan riichi correctly, but not everyone can make the most out of a start like this. Every time a start like this happens, those who can play it correctly gain a little compared to those who can't.

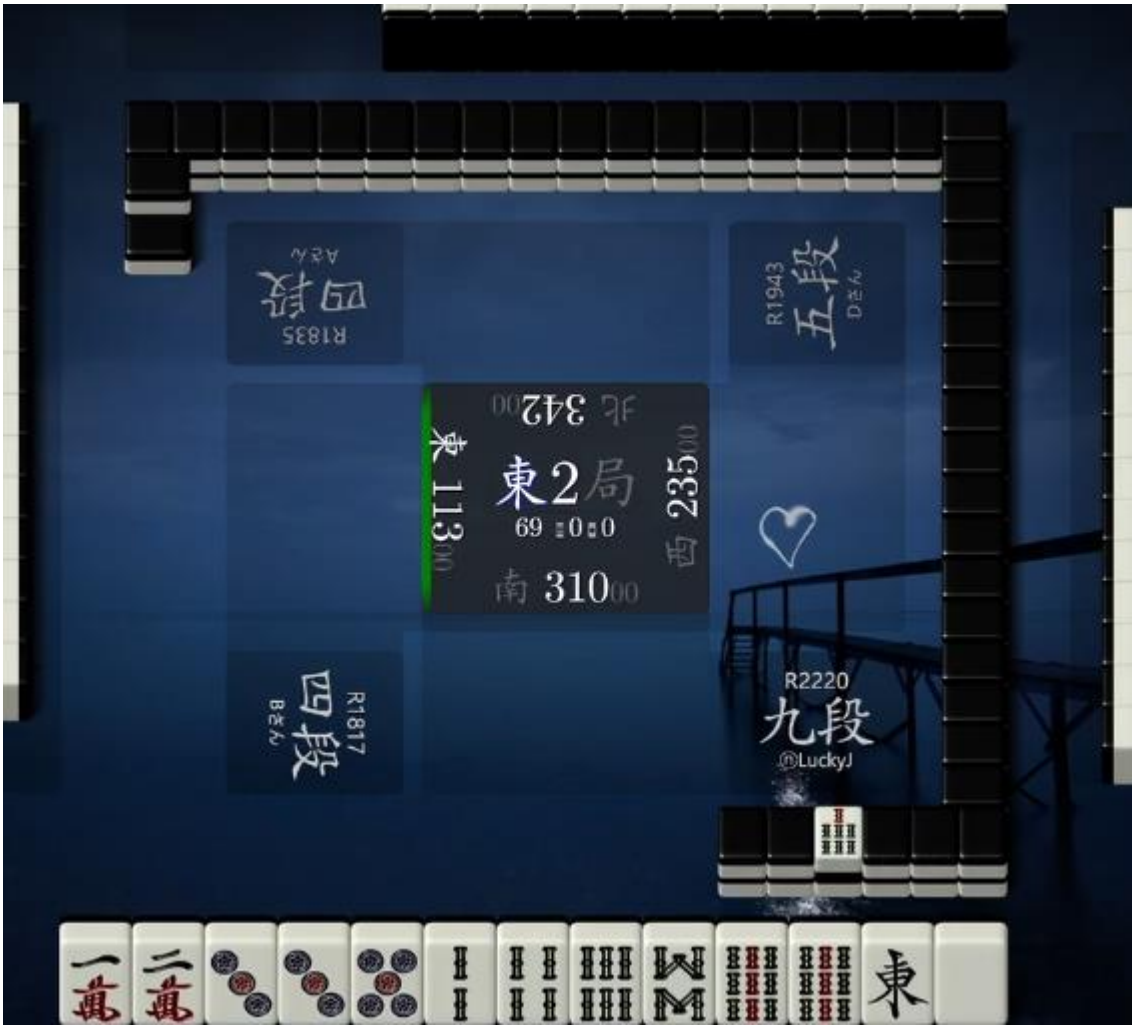
One constant theme with advanced strategy is adjusting based on opponents' speed and whether the round is in the early, middle, or end game. When to keep safe tiles, what yaku to pursue, and which floating tile to keep are all heavily influenced by how likely the hand is to be ahead or behind.

This round shows a strategic principle that safe tiles are the most useful for middling-strength hands. With a strong hand, safe tiles aren't needed because the hand is strong enough to push dangerous tiles against riichi. With a trash hand, safe tiles also aren't needed because it's no big loss to break it to fold. This means safe tiles are the most useful with hands that aren't strong enough to push dangerous tiles after falling behind, yet good enough that breaking them to fold is an appreciable loss. This hand is the perfect example, where the robot discarded 4p on turn 7 to keep a safe tile.

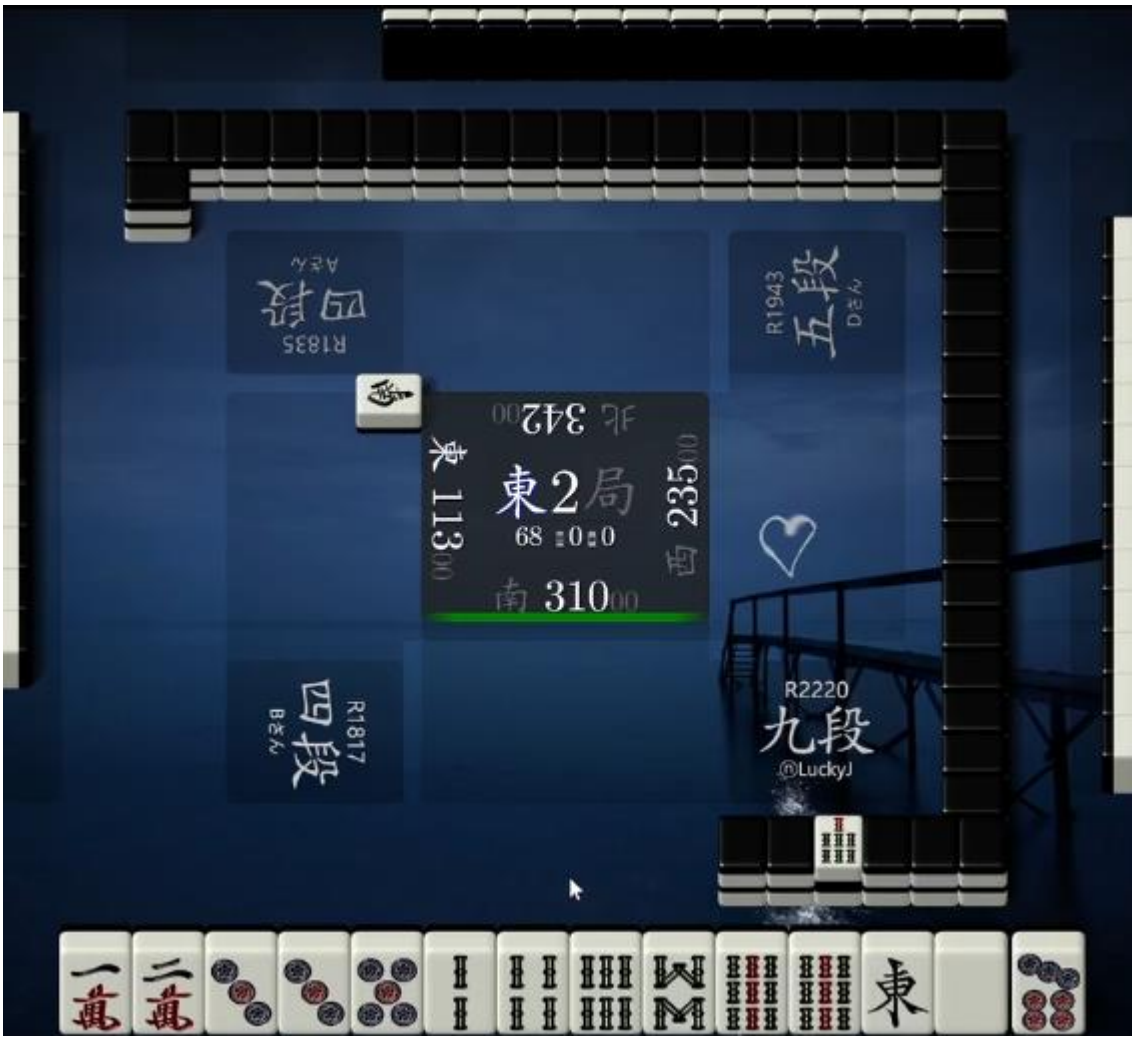
Despite the importance of safe tiles, it's still usually wrong to keep them at 1-away with worse than ryanmen-ryanmen acceptance. This is an application of "1-away peak theory," which states that acceptance at 1-away is especially important. This not only applies to early tile efficiency but also informs plays like the discard of East on turn 8.

Finally, do not fear atozuke. This round was won by going atozuke on a single tile. A hand must win with five blocks, but it doesn't make a difference in which order. For atozuke to cost, the wrong wait needs to be drawn, discarded (instead of kept to fold), and then an opponent needs to discard the right wait. It's possible for the combined odds of all these things happening to swing a decision, but it usually doesn't. If the reward justifies the risk, there's no issue with going atozuke, even on a single tile for 1000 points.

Hand 20



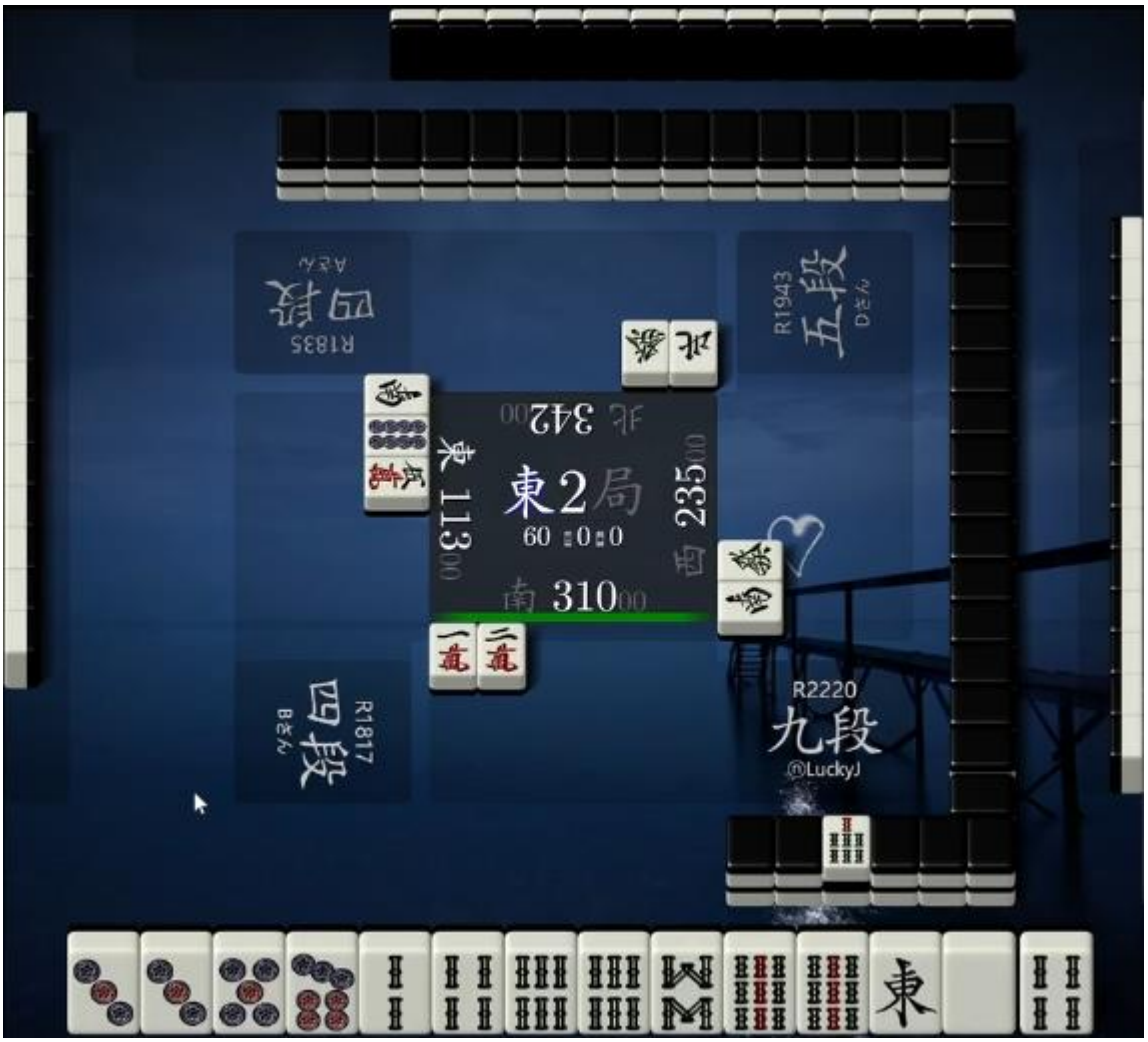
East 2, second place. No strategy adjustments for score are needed this early in the match.



This is a poor hand with all bad shapes. Its only hope of gaining speed is pairing a yakuhai.

It's hard to apply the five-block method with a hand like this. Shapes like 3357p and 246899s can become different numbers of blocks depending on what tiles they gain. In the early game, the best way to treat this kind of hand to not divide it into blocks at all. Instead, keep these ambiguous shapes intact, maintain flexibility in shape, and only decide their final divisions into blocks when more draws reveal more information on how.

Following this reasoning, the entirety of 3357p and 246899s should be kept until it's clear what roles they play in the hand. Both single yakuhai should be kept in case they become a pair, leaving 12m as the only discard candidates. The robot **discards 1m**.



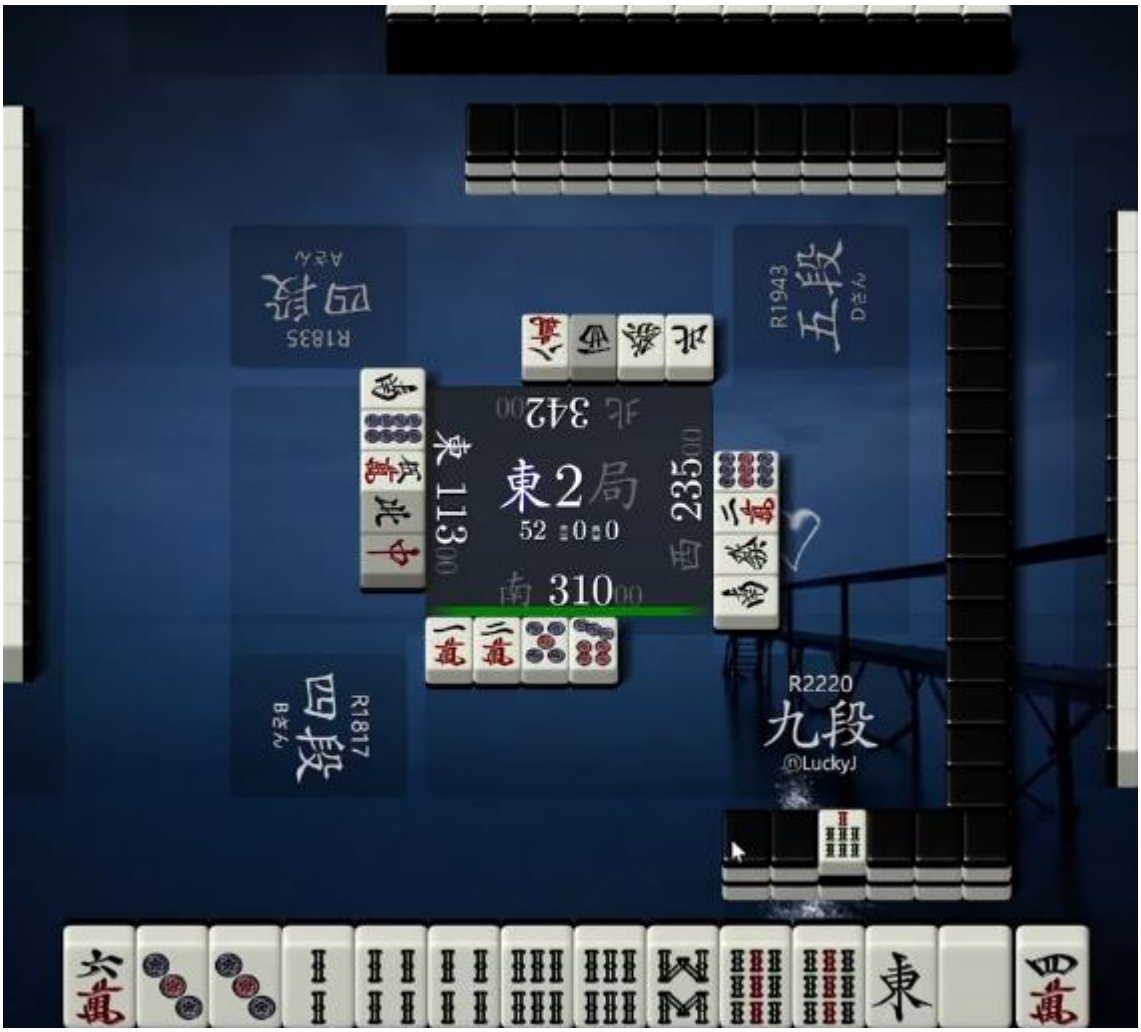
The hand gains its fourth pair, opening the door for chiitoi. The play to balance chiitoi and regular shape speed is 2s, but in this case, 2s needs to be kept in case the hand turns into a flush. 7p looks like the next best discard. However, the robot **discards 5p** instead.

While discarding 7p keeps the 335p complex joint intact, 5p has the issue that even upon gaining 4p, the hand's regular shape prospects don't become strong enough to break 3p. This means 5p is closer to being a lone tile than part of the 335p joint, and the possible gain of 4p is dispensable.

Compared to 5p, 7p is both safer and more available in the wall after dealer's 8p discard. While 5p accepts red 5p, since chiitoi already has 8s for value, one additional dora matters quite little, not enough to offset the difference in pair candidate quality between 5p and 7p.

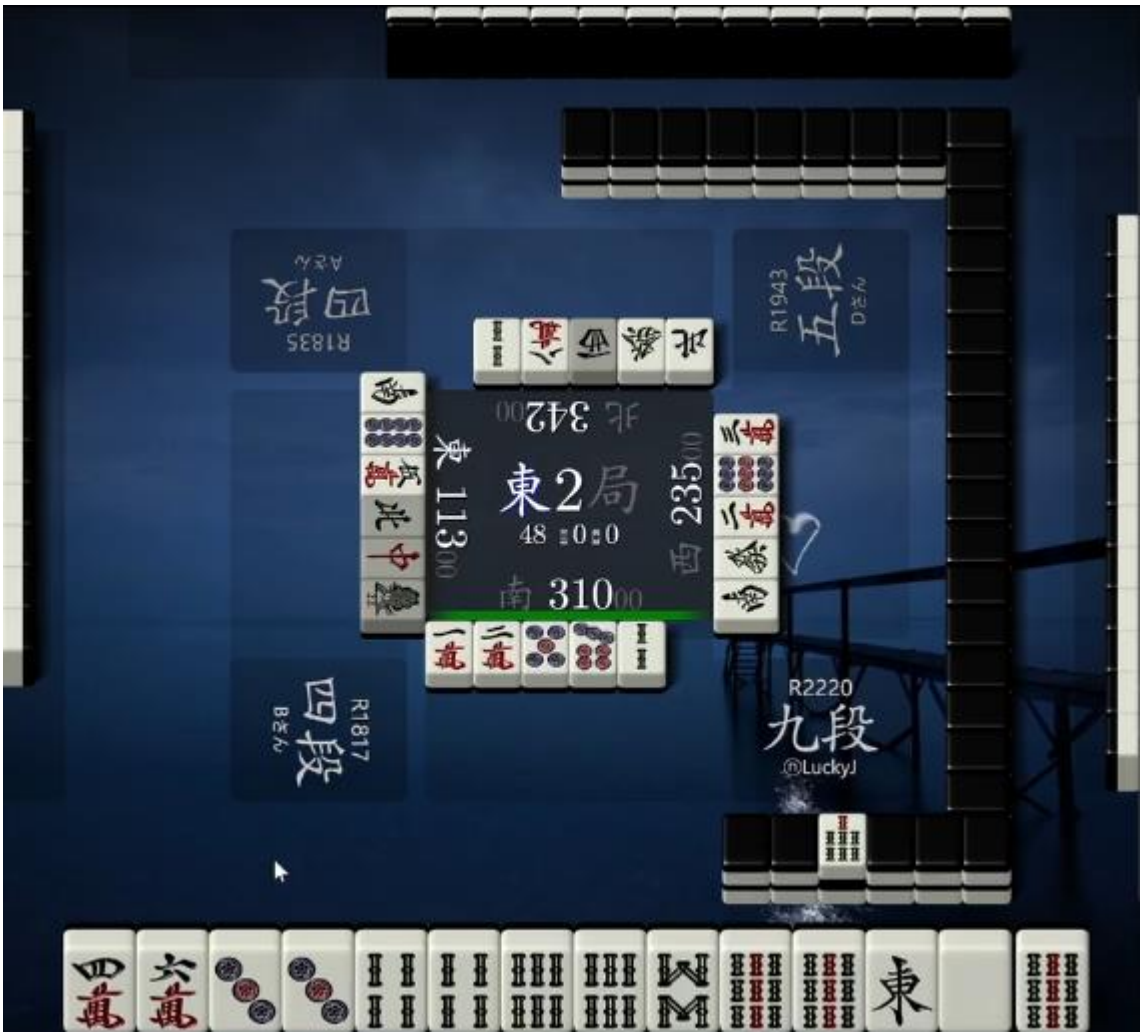
From a wall reading perspective, 6m and 7p are about the same in availability with both being next to dealer's discards. 7p can form furiten shapes due to the earlier 5p discard while 6m cannot. Finally, an interrupted break of 57p from hand would look more suspicious than breaking it consecutively. This matters if opponents end up defending against this hand's riichi, where suspicious discards might give away that it is not a regular-shape hand. All three reasons point to the robot **discarding 7p**.

Starting the round by breaking two joints from hand is a sign of strength. In this case, the bluff effect is beneficial as this hand is weak. Opponents, upon seeing these discards, might hold safe tiles, try to deny calls, or cheapen their hand to race, all of which are to the robot's benefit.



It’s now turn 5, and the hand still has 4 odd-suited tiles to discard for a flush. Since pursuing flush also requires breaking 33p and foregoing chiitoi, flush is no longer a viable goal. The robot **discards 2s**, applying the same principle as the 5p discard that 3s acceptance is dispensable because it doesn’t strengthen the hand enough to discard 4s.

While breaking 46m would keep both chiitoi and flush chances open, it drastically reduces the chances of the hand ending up tenpai at draw. This might be correct earlier in the round but turn 5 is too late to break joints this way.



Upon drawing 9s, the hand no longer has room to hold both yakuhai. The robot **discards White Dragon**. East is the better discard, but this is one case where the robot randomizes its play to be less predictable.

After the lucky 5m draw last turn, the hand reaches a nice 1-away. The robot **discards 3p** for maximum acceptance, abandoning chiitoi as regular shape is now strong enough.

The robot **discards 6s**, the most efficient play. “Three skipping pairs” should be memorized as a basic shape.

Facing dealer's riichi, the robot of course **declares riichi discarding 6s** to chase with good wait mangan.

The rest of the round is omitted as there are no relevant decisions after riichi.

Closing

This hand illustrates two early-game principles.

First is staying flexible. Despite starting with five blocks, the robot didn’t hesitate to break one to give the rest of its hand the best chance to develop into something better. In the early game, breaking bad blocks to keep useful floating tiles is an important technique to improve the final shape of a hand.

Second is how the optimal direction to build a hand changes from turn to turn. The robot chose a slightly less efficient discard on turn 3 to hedge flush chances, then gave up on the flush two turns later without the hand having changed much. The sooner it is, the more it’s worth sacrificing efficiency to speculate on value and other benefits. There are cases where the exact same hand can have 3 or 4 correct discards depending on what turn it is. The exact criteria of when to stay open and when to narrow down to a main direction is hard to explain and best learned through examples and practice.

It's worth repeating that the worse a starting hand, the more carefully it must be played. Unlike good hands and even average hands, bad starting hands can’t win by pursuing simple efficiency. It takes knowing how to value lone tiles, which yaku to pursue, when to save safe tiles, and comprehensive strategy knowledge over the whole game to play these hands well. As this hand shows, even a very bad starting hand is often only a couple of lucky draws away from becoming good. The important thing isn’t the getting lucky itself, but rather setting the hand up to have the chance at all. Put more simply, you lose 100% of the chances you don’t earn.