

CSC 480: Artificial Intelligence

1- Introduction

April 15, 2025

**Rodrigo Canaan
Assistant Professor
Computer Science Department
Cal Poly, San Luis Obispo
rcanaan@calpoly.edu**

About you

Group activity (5~10 mins)

About you

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Assemble into groups of 3 and share among yourselves:

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- What motivated you to take this course

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- What topic in Artificial Intelligence you would most like to learn in this course

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- Degree / year
- Pronouns, if desired
- What motivated you to take this course
- What topic in Artificial Intelligence you would most like to learn in this course
- As a group: one question you'd like to ask me

About me

- Pronouns: He/Him/His
- Bachelor in Computer Science at UFRJ (Rio de Janeiro, Brazil, 2007-2011)
- Software engineer at Petrobras (2012-2017)
- Ph.D. in CS at NYU (2017-2021)
 - Focus on AI and (cooperative) games
- Assistant prof. at Cal Poly (Fall 2021 - Present)

You and AI

Show of hands

You and AI

Show of hands

Raise your hand if you've ever:

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- Heard about the Turing Test

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- Solved a problem using machine learning and/or neural networks

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- Learning about AI algorithms

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- Covering various recent developments in AI

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What will this class be about?

- Learning about AI algorithms
- Covering various recent developments in AI
- Reading and discussing academic papers
- Implementing your own algorithms in lab and project activities

Artificial Intelligence

Trying to define AI

What is AI?

Individual / Group activity

Individual / Group activity

Individually:

Individual / Group activity

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- Write down your own definition of Artificial intelligence.

Individual / Group activity

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- Start with something like “Artificial Intelligence is a/the/any...”

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- Post your answers to the slido poll available via the qr code provided by the instructor

Trying to define AI

AI is the WHAT?!?

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Some categories of definitions of Artificial Intelligence



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- ❖ A field of study



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AI is the WHAT?!?

While not all definitions seen in this introduction are of this category, we will favor “Field of Research-type” definitions

- ❖ Favored by most modern AI researchers, avoids some misconceptions

Zachary Lipton @zacharylipton

Dear world (CC [@businessinsider](#), [@Hamilbug](#)): stop saying "an AI". AI's an aspirational term, not a thing you build. What Amazon actually built is a "machine learning system", or even more plainly "predictive model". Using "an AI" grabs clicks but misleads



Amazon built an AI tool to hire people but had to shut it down because...
Amazon tried building an artificial-intelligence tool to help with recruiting, but it showed a bias against women, Reuters reports. ...
[businessinsider.com](#)

8:09 PM · Oct 10, 2018

443 28 Share this Tweet



AI is the WHAT?!?

While not all definitions seen in this introduction are of this category, we will favor “Field of Research-type” definitions

- ❖ Favored by most modern AI researchers, avoids some misconceptions
- ❖ Instead of using “an AI” as a noun, think of using (depending on context)
 - ❖ An algorithm
 - ❖ A system
 - ❖ A model
 - ❖ A bot
 - ❖ An agent
 - ❖ An NPC

Individual / Group activity

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- Circle the first down that appears after “AI is...” on your individual/team definition.

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- Write down which category (field/capability/entity) best matches your definition

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Trying to define AI

What is AI?

Dimensions of AI definitions

AI can be defined as the effort to make systems that...

	Human-like	Rational
Cognitive	Think like humans	Think rationally
Behavioral	Act like humans	Act rationally

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Modern AI researchers favor the “act rationally” definition

For some applications, acting like humans is sometimes also important

Human-like acting: the Turing Test

- ❖ The 1950 paper “Computing Machinery and Intelligence” will be your first reading
- ❖ A guided report will be posted on Canvas (due Sept 29), focusing on:
 - ❖ Summarizing the mechanics of the test and how it relates to intelligence in Turing’s original view
 - ❖ Analyzing the objections and counterpoints offered by Turing himself
 - ❖ Analyzing the historical context, including ethical and social critiques
 - ❖ Your own “verdict” of the test
 - ❖ Humor!



Movie poster for The Imitation Game

Individual / Group activity

	Human-like	Rational
Cognitive	Think like humans	Think rationally
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Individual / Group activity

- Underline the part of your individual and team definitions that displays the capability that an AI system (or the field) should possess / develop

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- Underline the part of your individual and team definitions that displays the capability that an AI system (or the field) should possess / develop
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	Human-like	Rational
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	Human-like	Rational
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Some other definitions

- “the study of intelligent behavior achieved through computational means.” - check source either Russel & Norvig or from the 481 book
- “the effort of building machines to be good at whatever they’re currently not good at” - If it already works, it’s not AI!!! **hunt down source as well**
- “It’s just search! ” - Julian Togelius
 - Search for good actions (like deep blue)
 - Search for good sets of weights (modern deep learning)
 - Search for good attributes/solutions (evolutionary computation)

A bit of my own research

Most breakthroughs in game AI are **competitive...**

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Most breakthroughs in game AI are **competitive**...



Many interesting applications are **cooperative**!

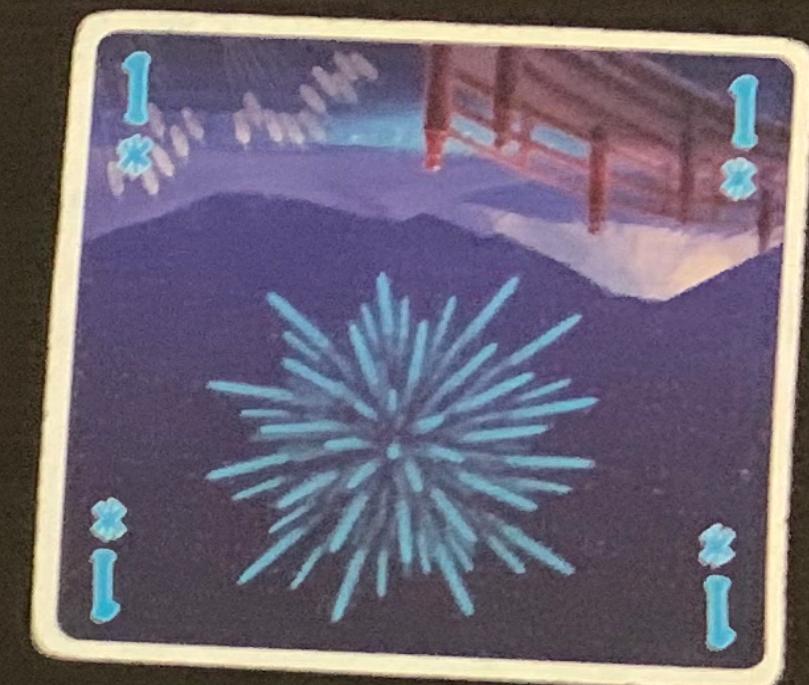
Agenda

1. Cooperative ad-hoc play in Hanabi
2. Generative Design in Minecraft
(GDMC) PCG competition



Hanabi (Antoine Bauza, 2010)

The goal: build piles of colored cards by playing them in order



The catch:
Players do not see
their own hands!



The catch:
Players do not see
their own hands!

Players cannot
communicate freely



Rules of the Game

On your turn, choose one action:

Play a Card

Give a Hint

Discard a Card

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On your turn, choose one action:

Play a Card

- **+ 1 point for the team** (if it fits) OR
- **-1 life for the team** (if it doesn't)

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- **-1 hint token** for the team
- Point to all cards with a chosen color or value in target player's hand

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- **-1 hint token** for the team
- Point to all cards with a chosen color or value in target player's hand

Discard a Card

- **+1 hint token** for the team
- May make some piles impossible to complete

Deck
(31/50 cards)



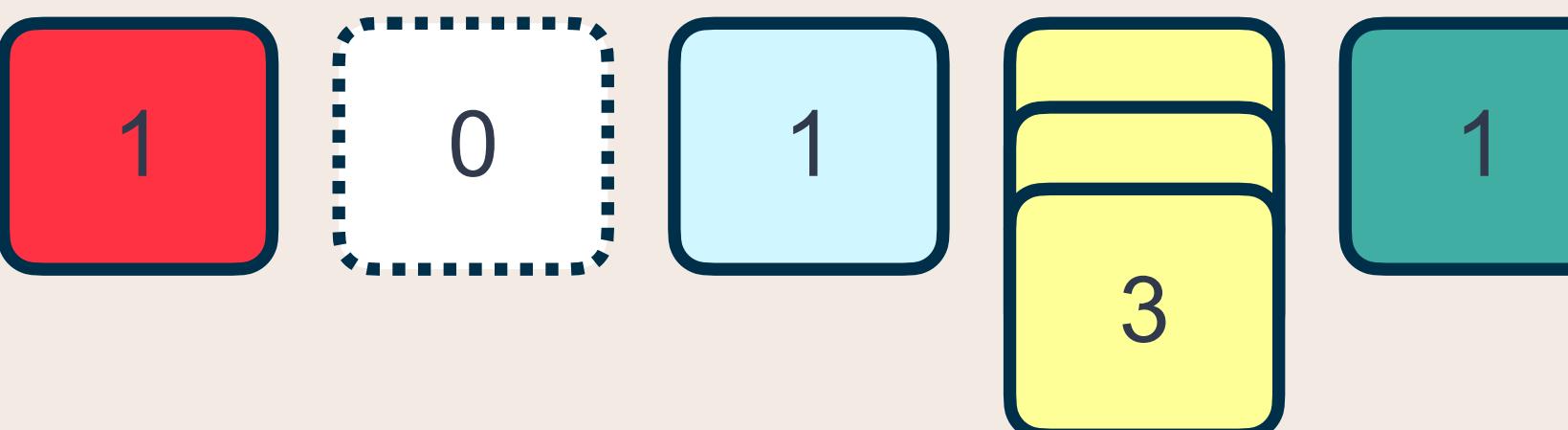
Actions (choose one)

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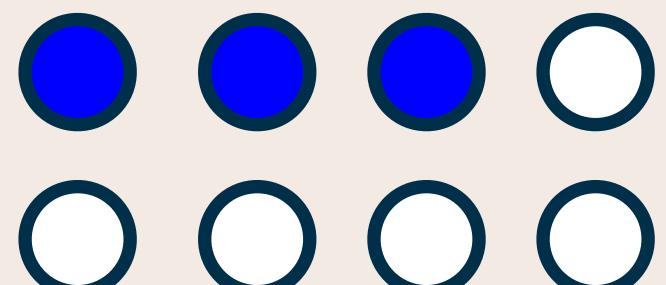
Their Hand



Board
(6 points)



Hints
(3/8)



Lives
(3/3)



Discard Pile
(2 cards)



My Hand



Deck
(31/50 cards)



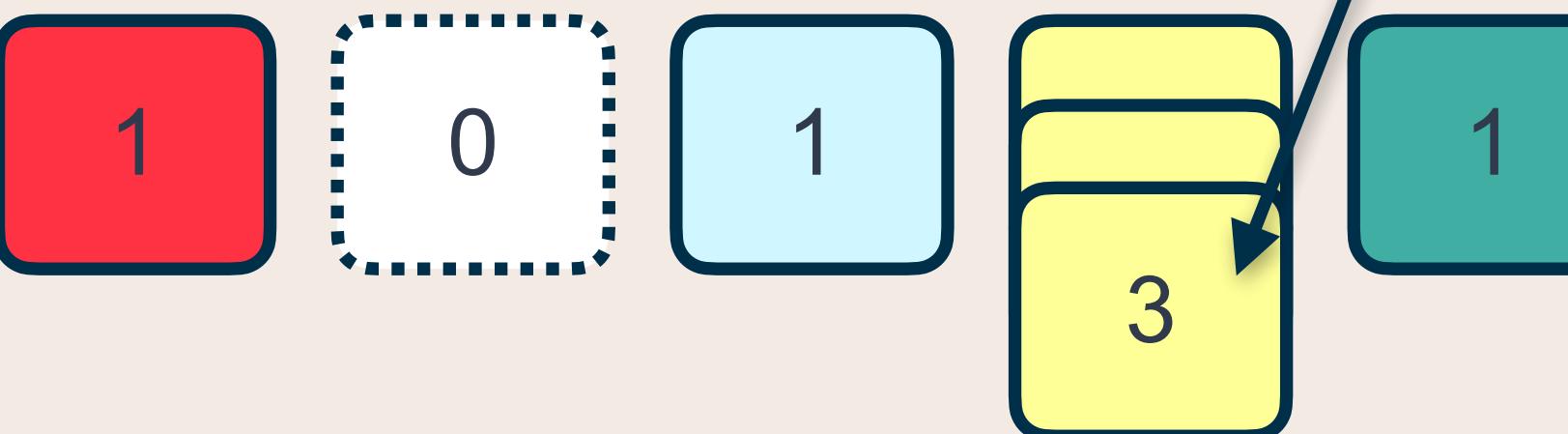
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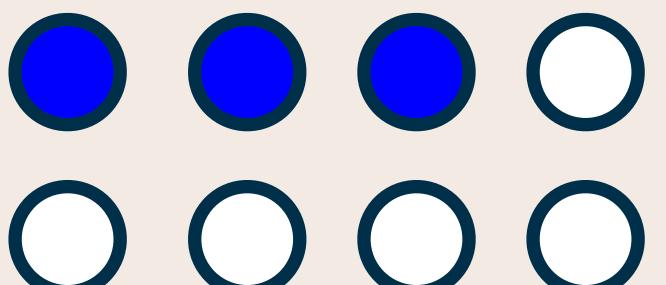
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Discard Pile
(2 cards)



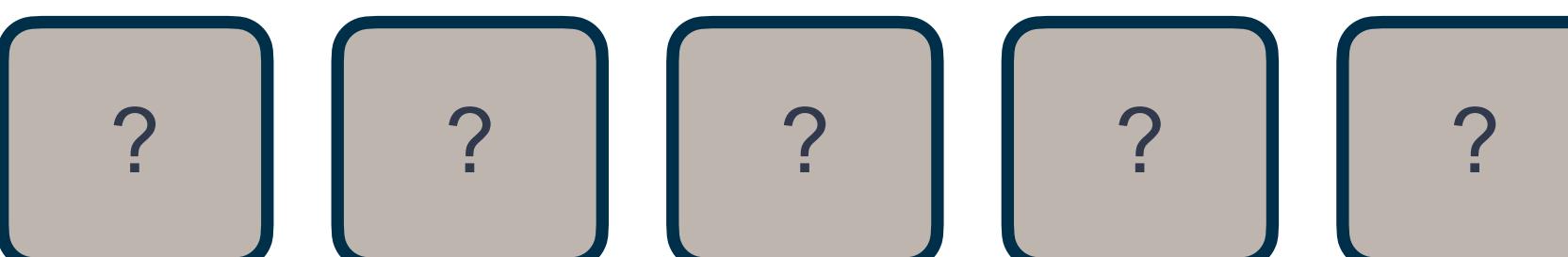
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(3/8)



Lives
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My Hand



Actions (choose one)

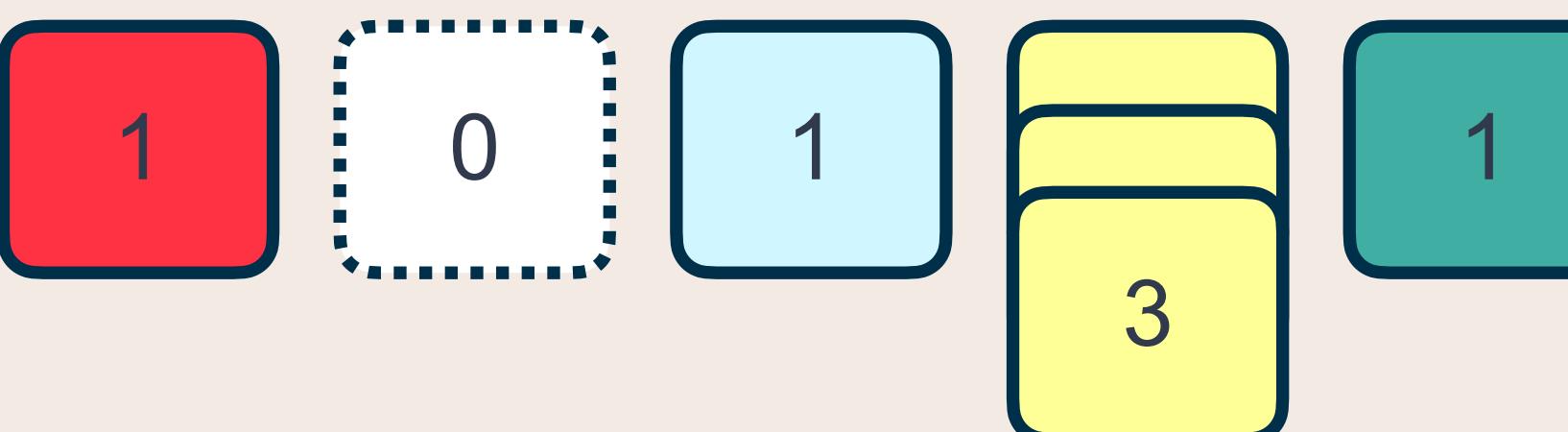
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Their Hand

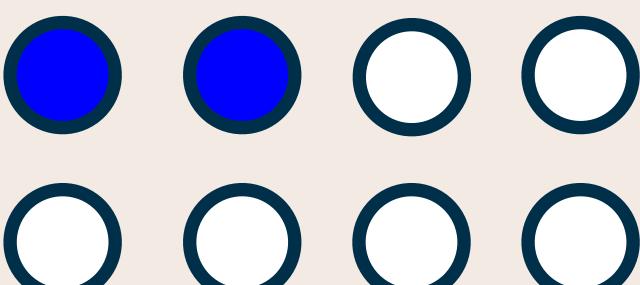


"This card is yellow!"

Board (6 points)



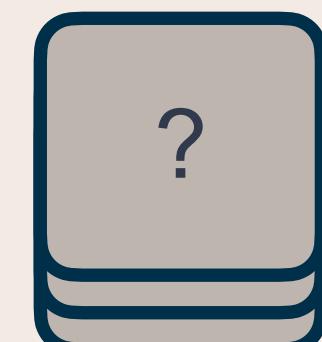
Hints (2/8)



Lives (3/3)



Deck (31/50 cards)



Discard Pile (2 cards)



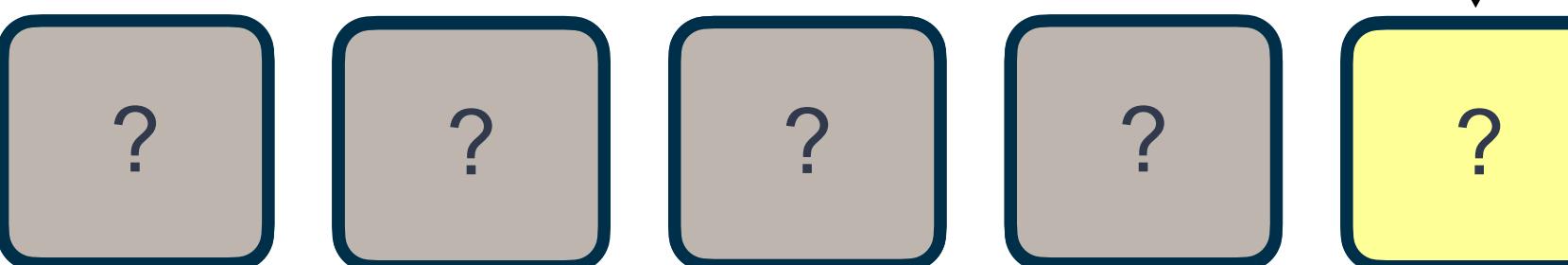
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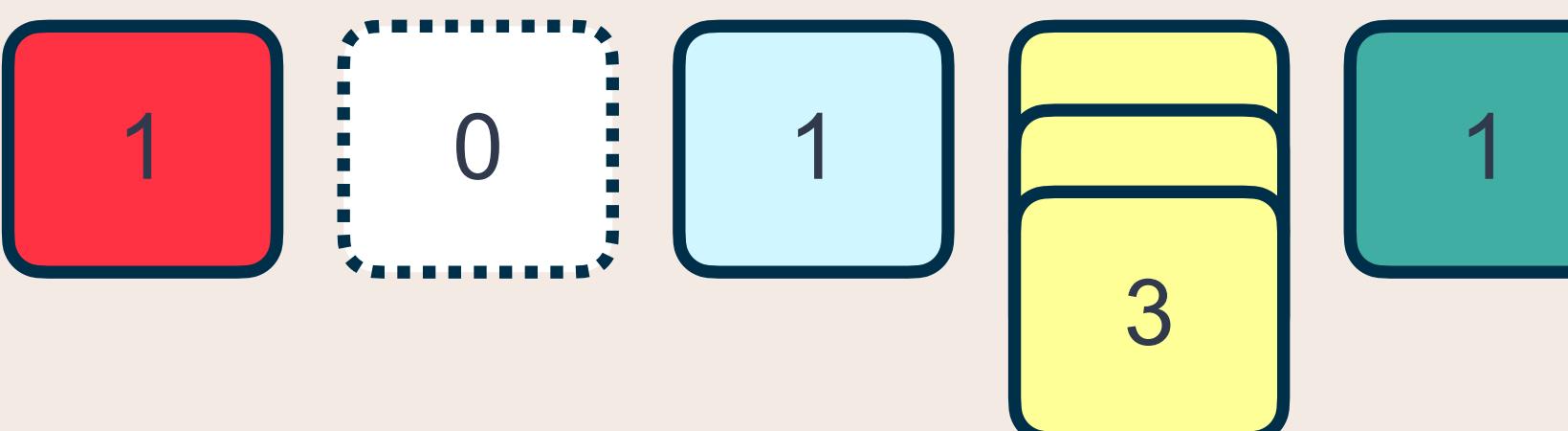
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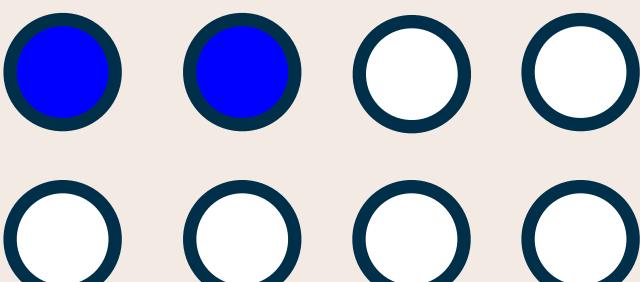
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Board (6 points)



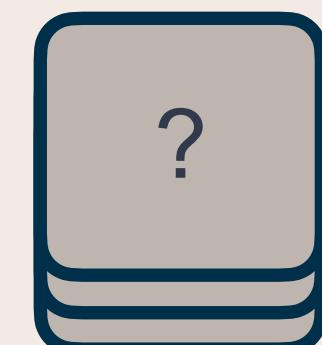
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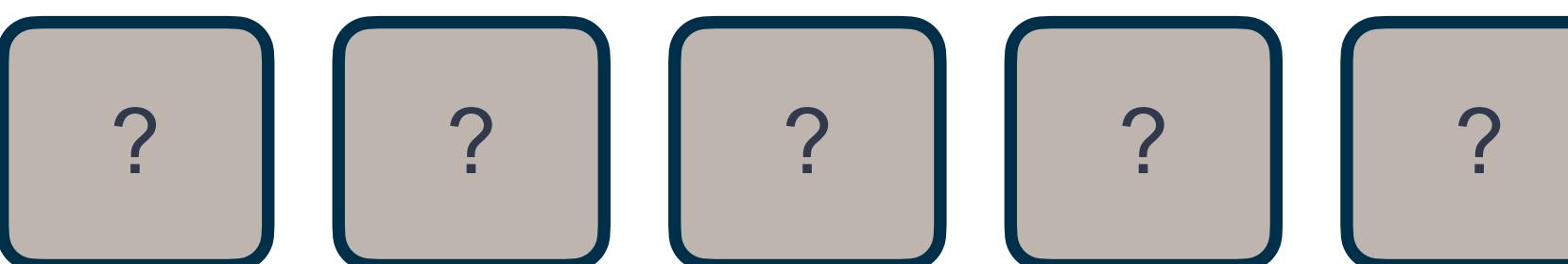
Deck
(31/50 cards)



Discard Pile
(2 cards)



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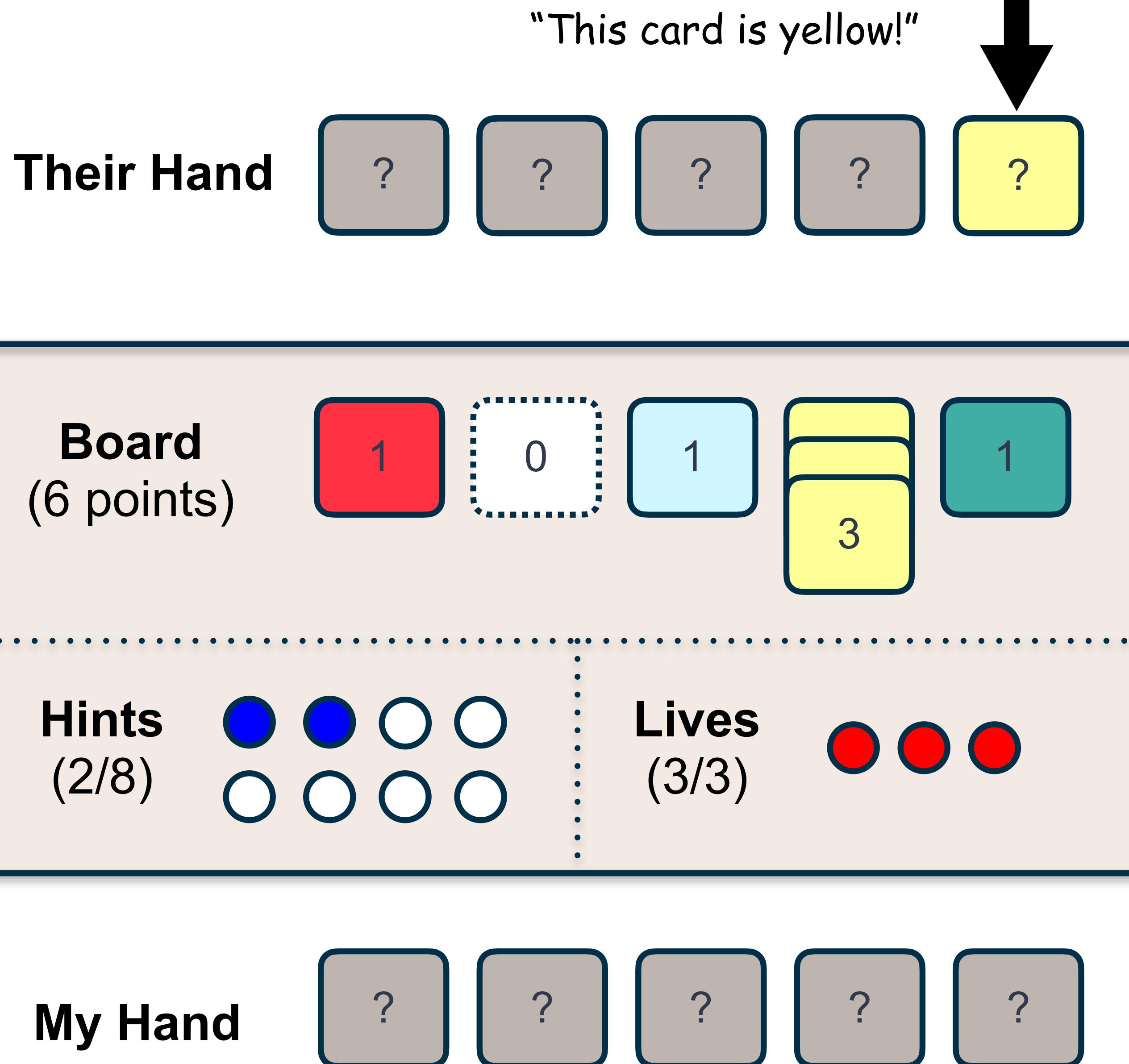


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Example conventions:

- Assume playable

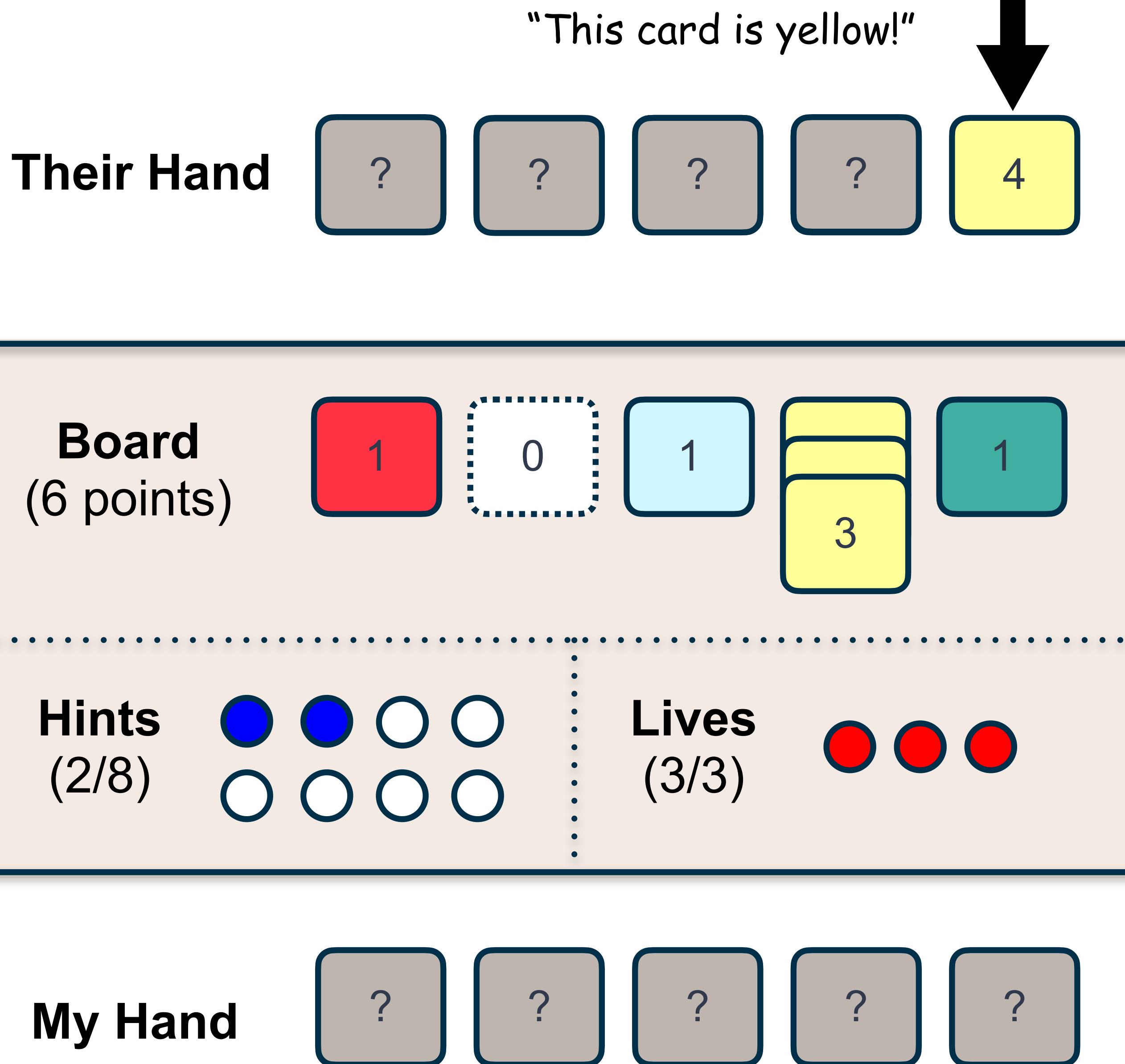


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Discard Pile
(2 cards)

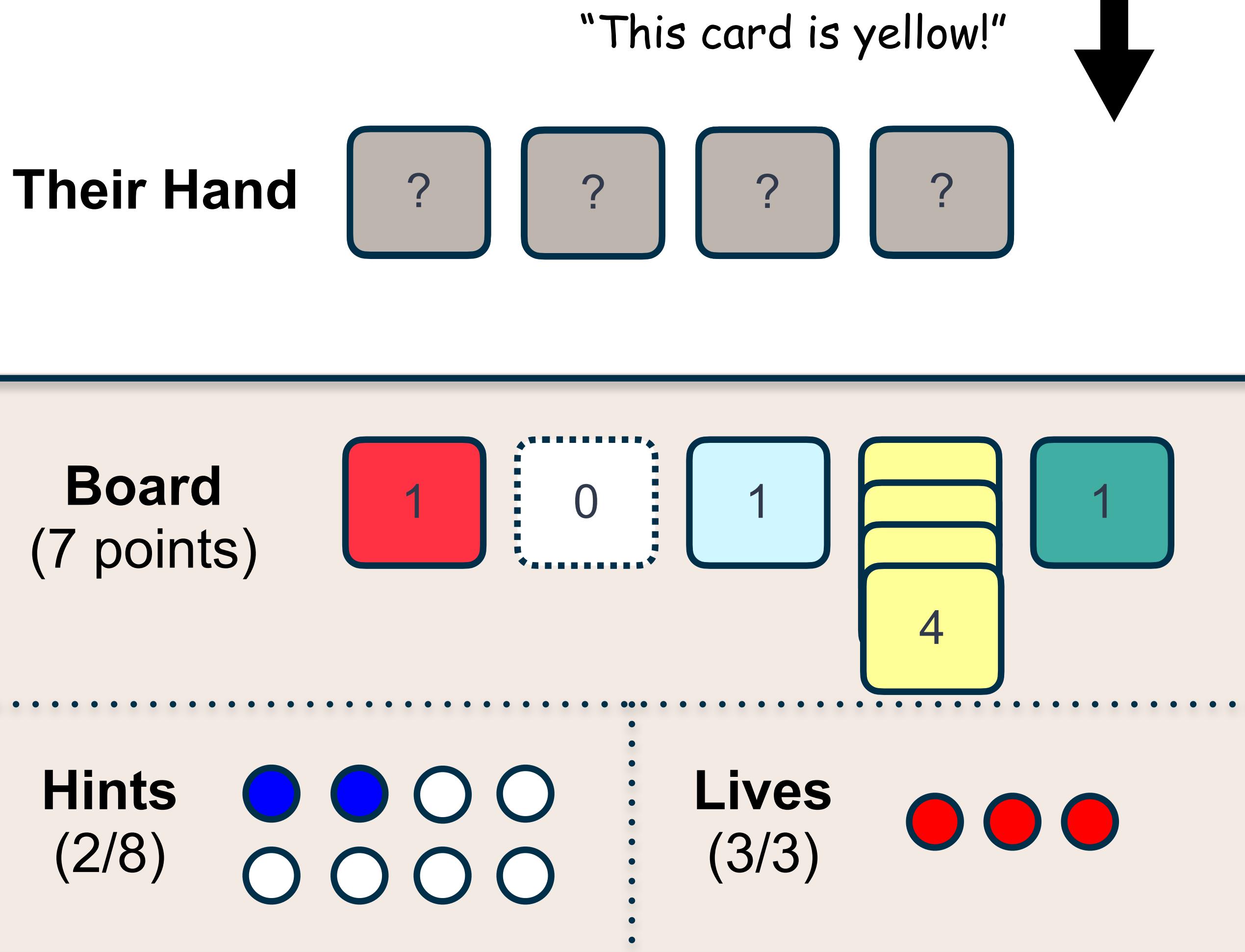


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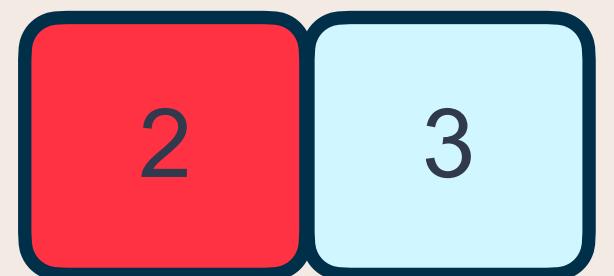
My Hand



Deck
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Discard Pile
(2 cards)

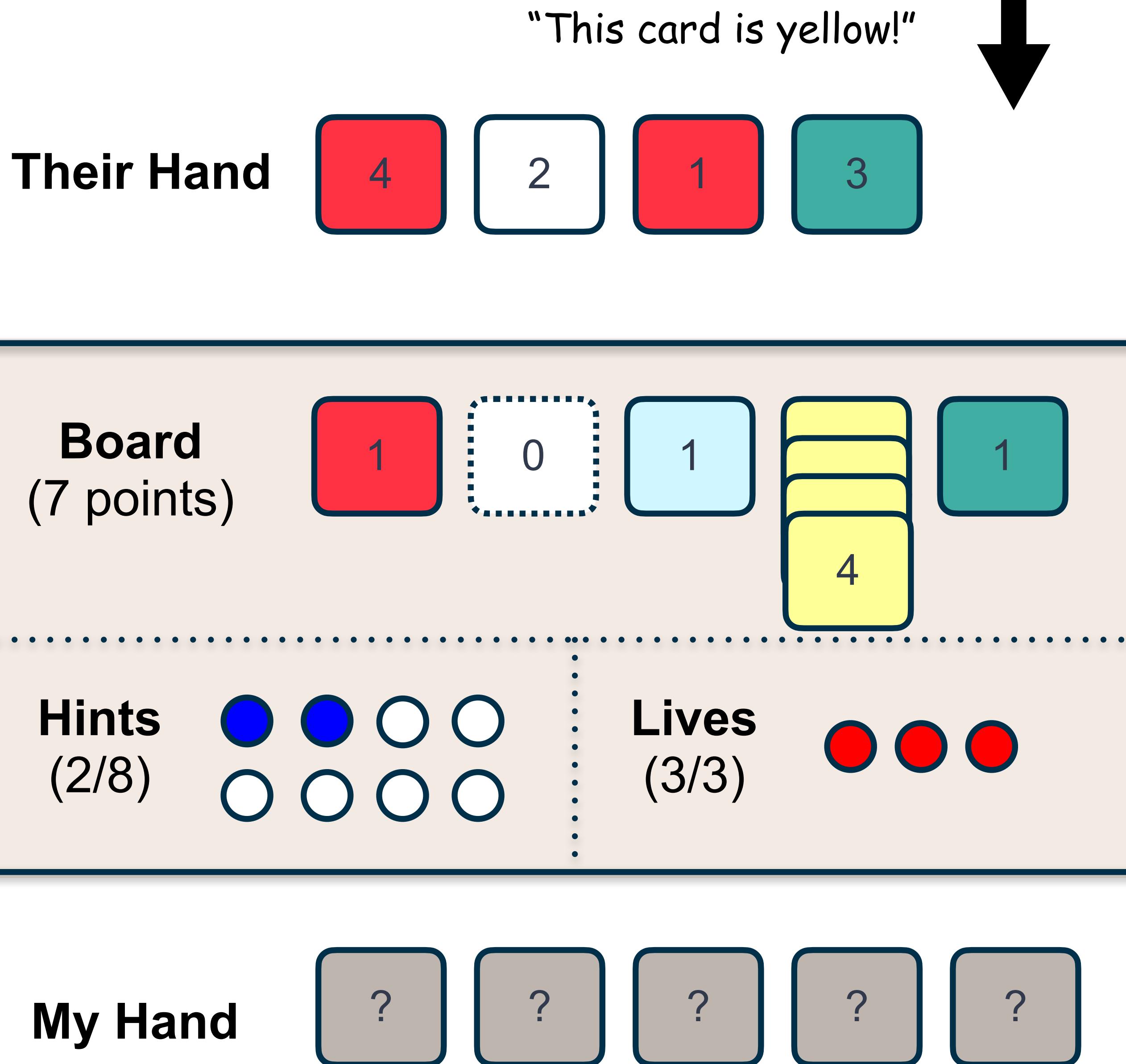


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Discard Pile
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(30/50 cards)



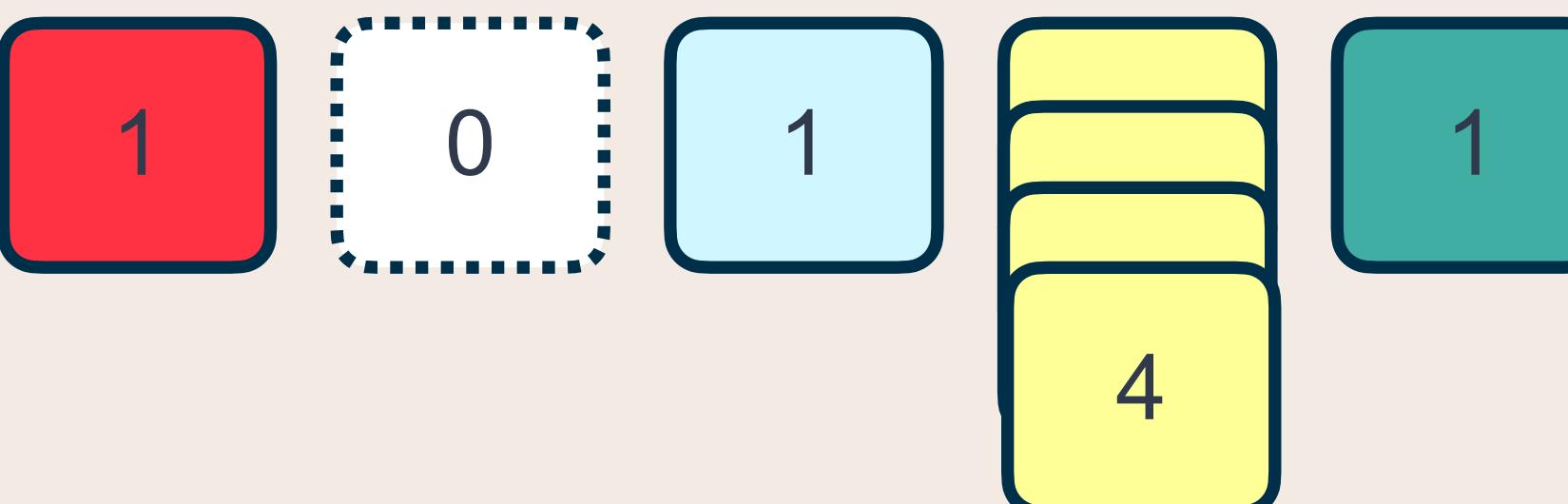
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Their Hand



Board
(7 points)



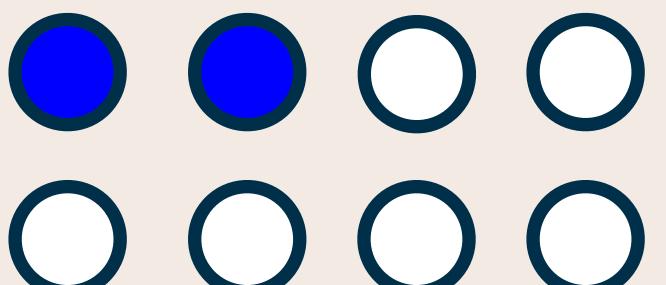
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Example conventions:

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My Hand



Hidden information

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In Hanabi, we lack information:

Hidden information

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About the game state
("What's in my hand?")

Hidden information

In Hanabi, we lack information:

About the game state
("What's in my hand?")

About the other players
("What conventions do they use?")

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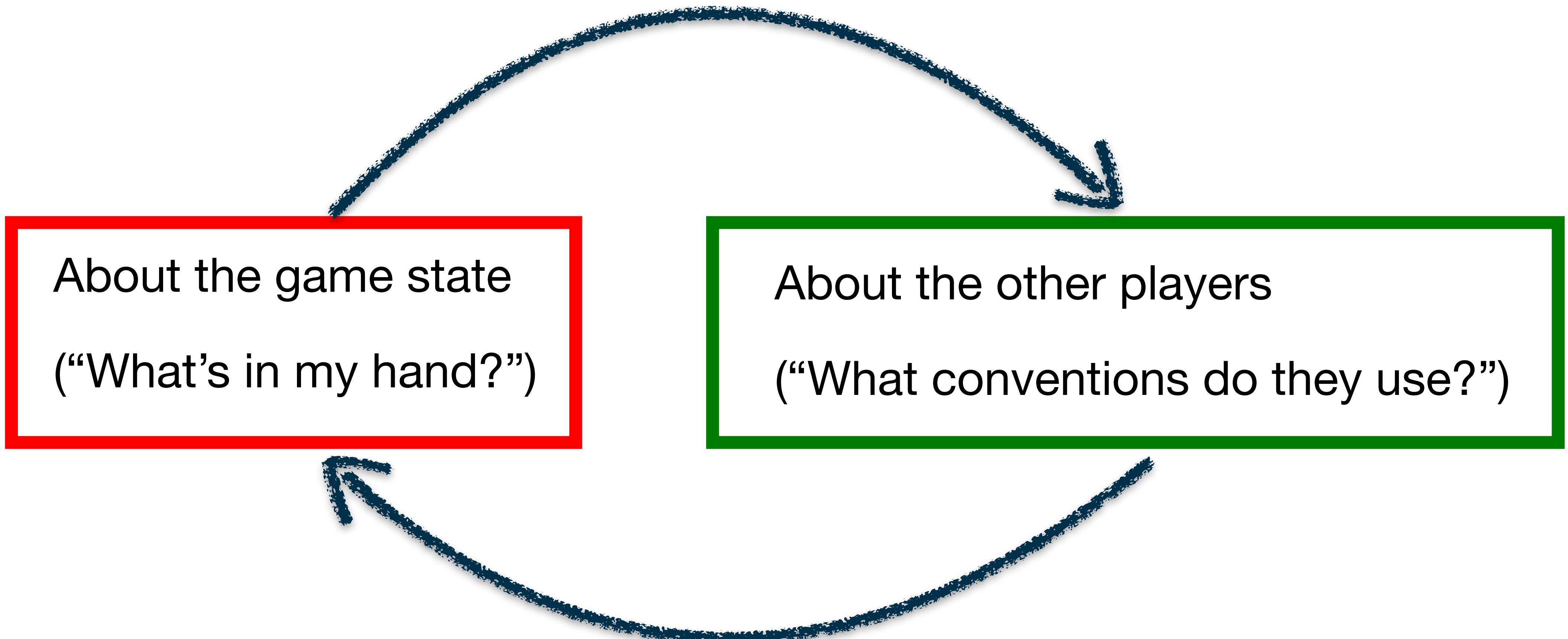
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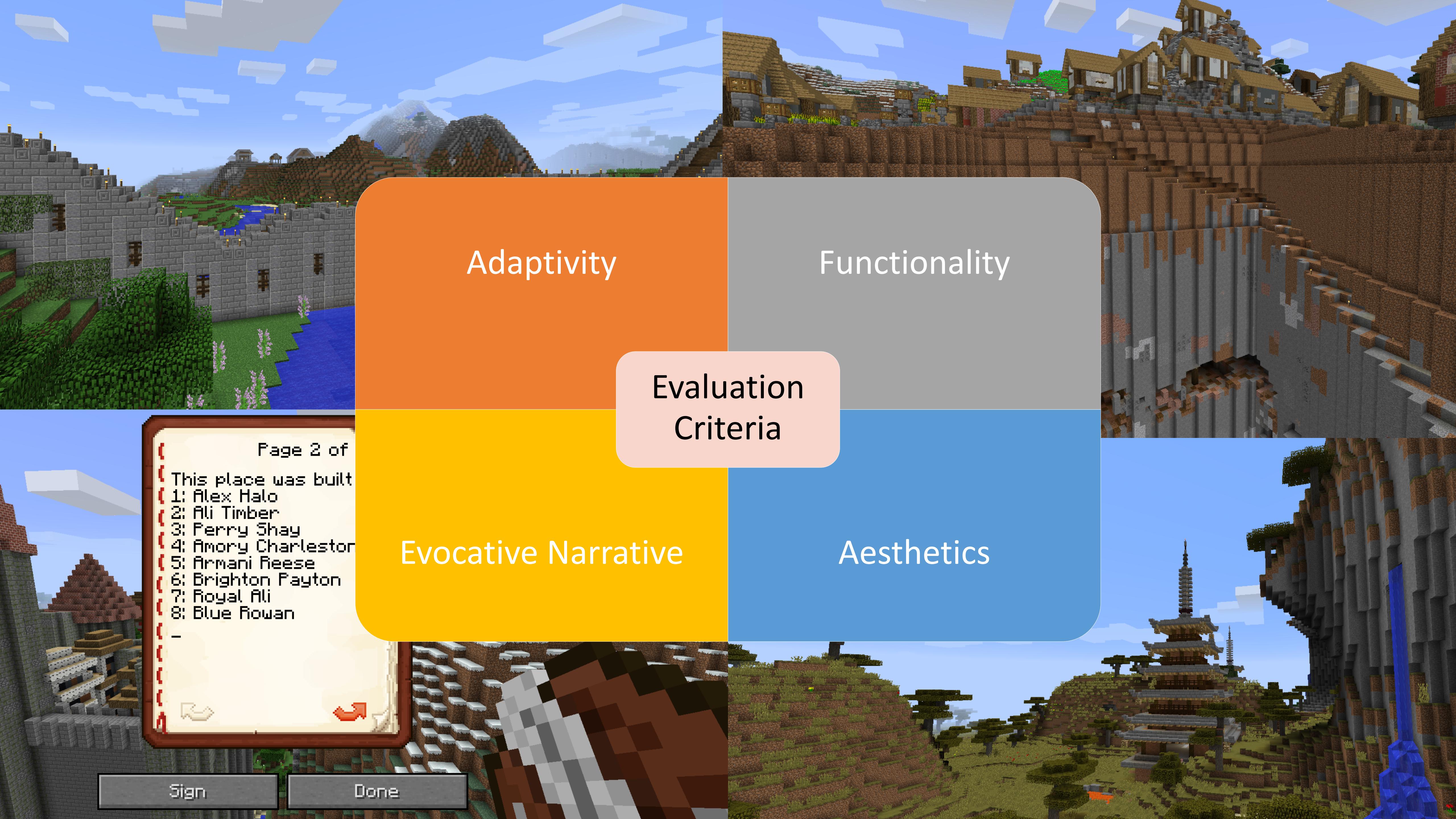
Generative Design in Minecraft Settlement Generation Competition

Christoph Salge, Michael Cerny Green, Rodrigo Canaan, Jean-Baptiste Hervé, Christian Guckelsberger, Julian Togelius

Write algorithm that:

- creates a settlement in Minecraft
- on an unseen map
- with human like quality.

A PCG competition



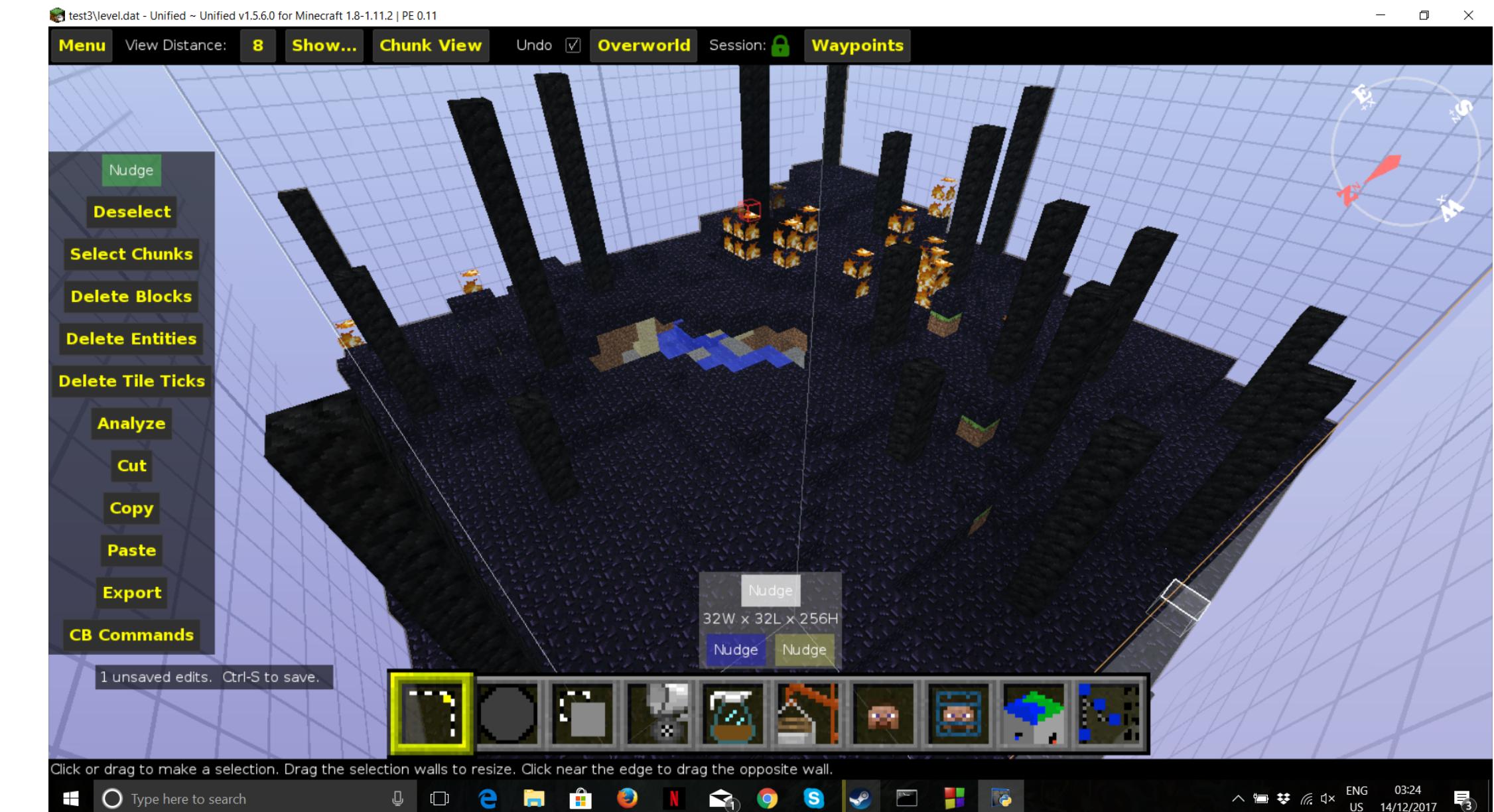
Framework based on MCEdit

EASY TO GET STARTED

PLUGIN IS A SINGLE PYTHON FILE

APPLY FILTER TO MAP

SEE RESULTS IMMEDIATELY



New HTTP
client by
Nils Gawlik



New HTTP
client by
Nils Gawlik



New HTTP
client by
Nils Gawlik



Evaluation

Evaluation

**Participants build algorithms for
settlement generation**

Evaluation

**Participants build algorithms for
settlement generation**



Organizers produce maps unseen by participants

Evaluation

Participants build algorithms for settlement generation



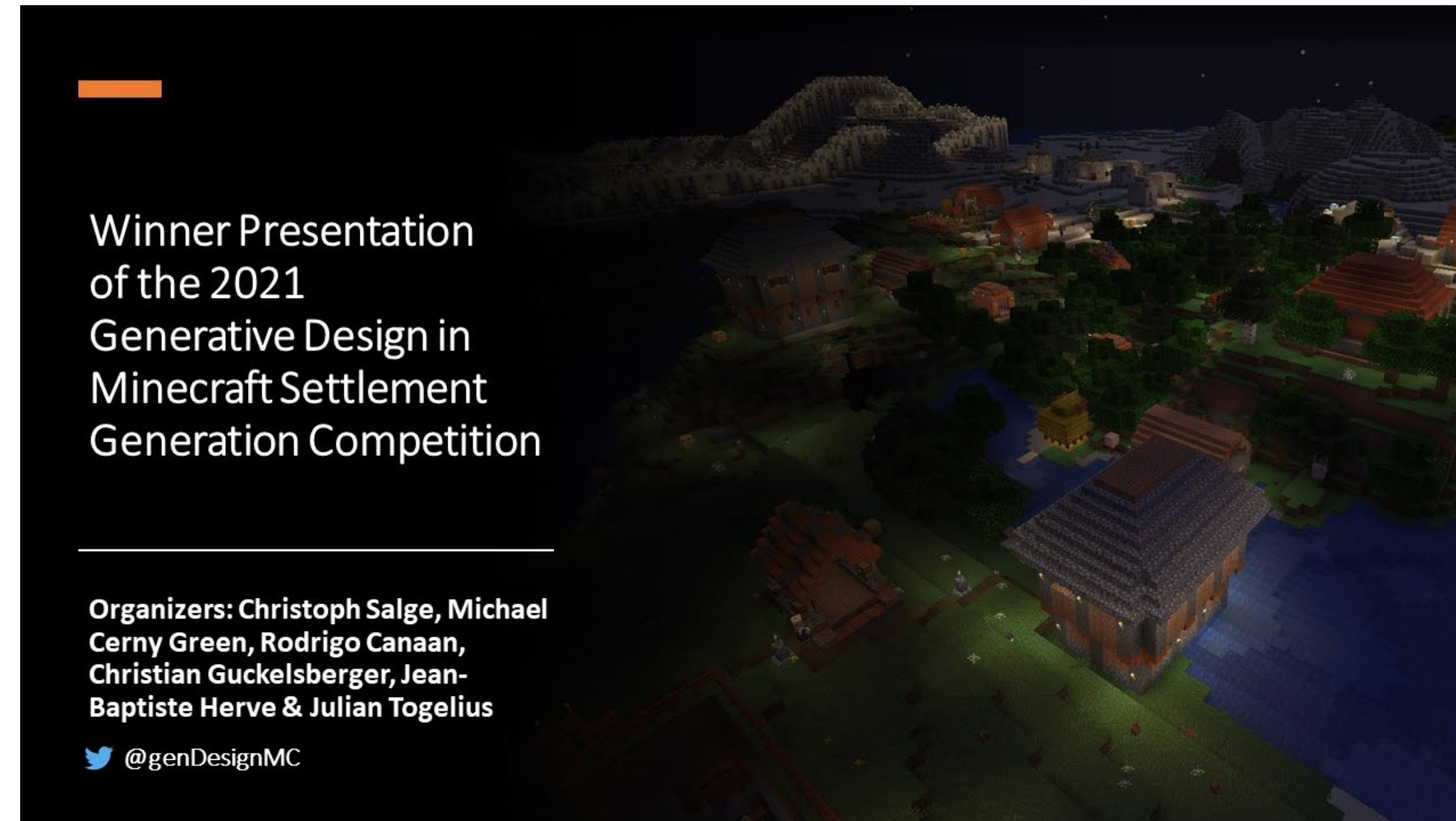
Human judges evaluate result



Organizers produce maps unseen by participants

Presentation of 2021 results Year Results

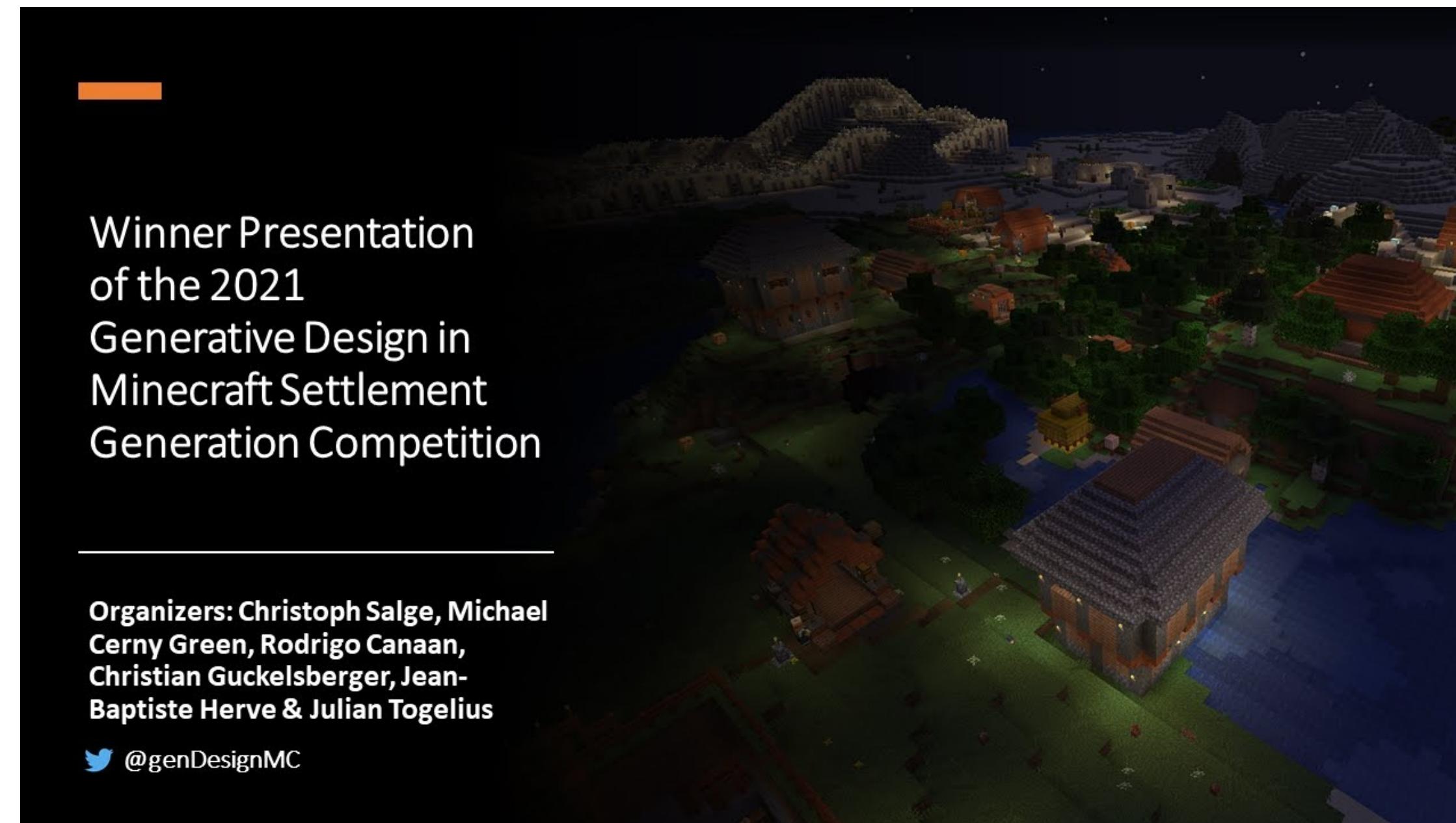
RESULTS PRESENTED AT THE 2021 FOUNDATIONS OF DIGITAL GAMES (FDG 2021) CONFERENCE



<https://www.youtube.com/watch?v=uYUIZUGPNX8&t=1s>

Presentation of 2021 results Year Results

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