Procedural Personas

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What are Personas?

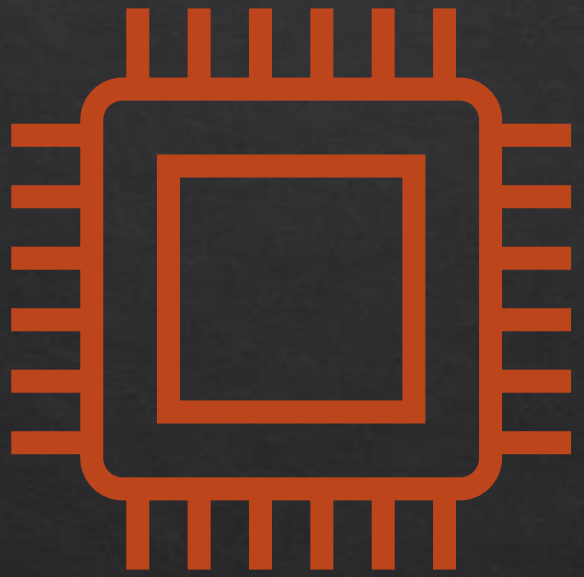
- Representation of player profiles based on patterns in
  - Gameplay
  - Motivation
  - Behaviour

Picture Source : https://www.pngfind.com/download/hhTwRmi_awards-persona-5-joker-render-hd-png-download

Traditional Approach

- Generated through user research and surveys.

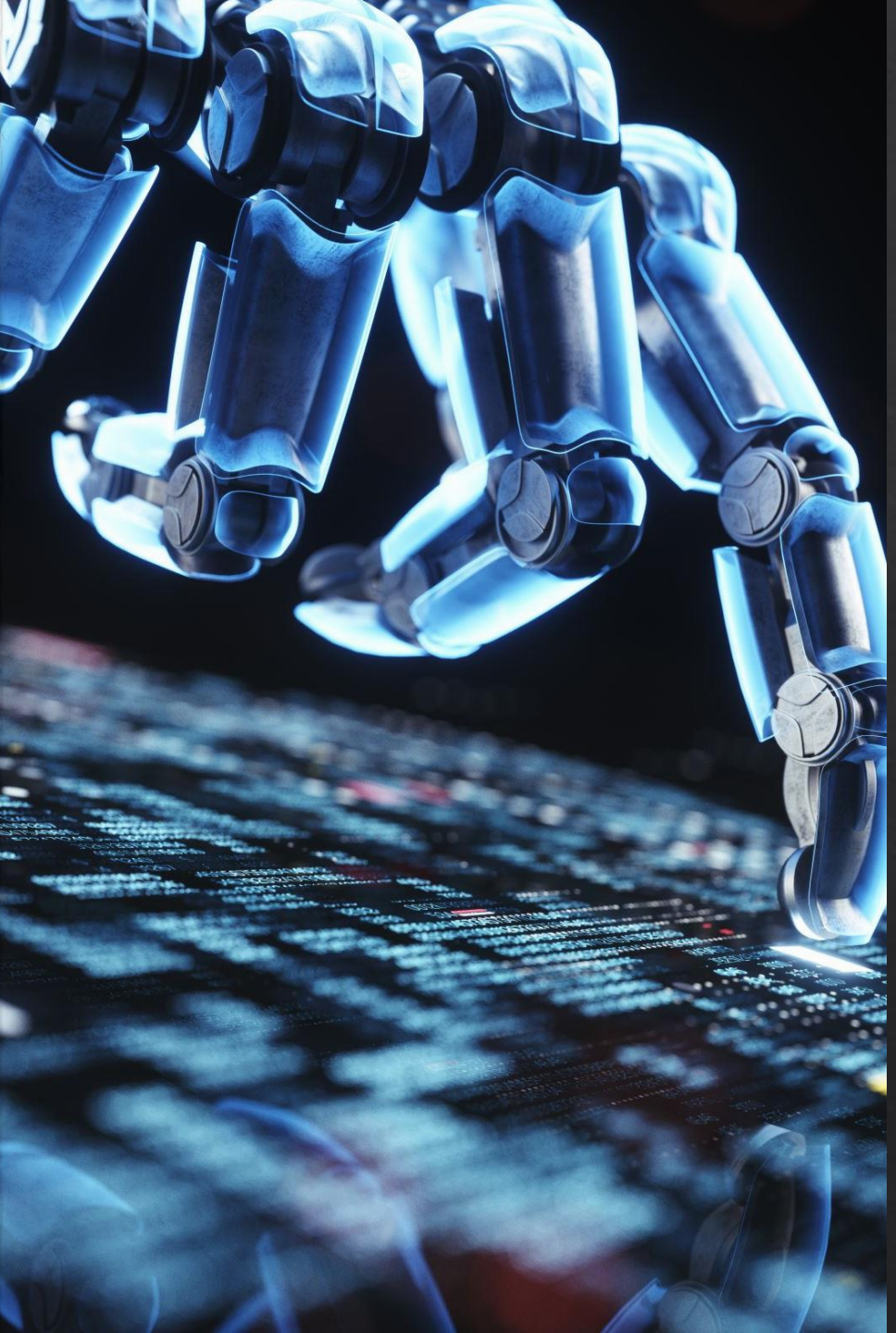
- Time-consuming
- Expensive
- Limited in scope.



Procedural Personas

What are Procedural Personas?

- Player personas are generated automatically by analysing gameplay data, game mechanics, and other relevant factors.
- Typically created using machine learning algorithms and statistical techniques.
- The data includes things like player behaviour, playstyle, skill and preferences for different mechanics of the game



How do they differ from Traditional Personas?

- Data-Driven.
- Automated.
- Scalable.
- Dynamic.
- Game-Specific.

Procedural Personas Why?

- Efficient and cost-effective.
- Objective.
- Adaptable.
- Large sample size.

Procedural Personas Limitations

- Lack of qualitative insights.
- Potential errors.
- Lack of contextual information.
- Privacy concerns.

Applications of Procedural Personas

- Game Design.
- Player Segmentation.
- Player Engagement.
- Player Retention.
- Player acquisition.

How are Procedural Personas Generated? (generalised)

Relevant game data is collected and analysed.

Patterns and characteristics are identified

Results are validated and refined.

- Some standout work on Procedural Personas
  - Defining Personas in Games Using Metrics[1]
  - Patterns of Play: Play-Personas in User-Centred Game Development[2]
  - Predicting Personas Using Mechanic Frequencies and Game State Traces [3]

[1] Tychsen, A. and Canossa, A., 2008, November. Defining personas in games using metrics. In Proceedings of the 2008 conference on future play: Research, play, share (pp. 73-80). DiGRA Conference.

[2] Canossa, A. and Drachen, A., 2009, September. Patterns of Play: Play-Personas in User-Centred Game Development. In DiGRA Conference.

[3] Green, M. C., Khalifa, A., Charity, M., Bhaumik, D., & Togelius, J., 2022. Predicting Personas Using Mechanic Frequencies and Game State Traces. In 2022 IEEE Congress on Evolutionary Computation (CEC) (pp. 1-8). IEEE.

Predicting Personas Using Mechanic Frequencies and Game State Traces

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Brief Overview of the study

Proposes a method for generating procedural personas based on two key components:

- Mechanic Frequency
  - The frequency with which players use different game mechanics.

- Game state traces
  - A sequence of states experienced by a player during gameplay.

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Action Agreement Ratio

At each state, if the next move calculated by the persona agent is in agreement with the human action then agreement metric is increased by 1. this is done at each state.

AAR is calculated by dividing agreement metric by the number of moves made.

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MiniDungeons 2

- A 2 dimensional deterministic game with the end game of reaching the exit in every level
- For the scope of the paper, 17 mechanics were tracked during play

Picture Source : Holmgård, C., Togelius, J., Liapis, A. and Yannakakis, G.N., 2015. MiniDungeons 2: An experimental game for capturing and modeling player decisions.

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- Enemy Kill
- Monster Hit – Goblin hit, Minitour hit, Goblin Wizard hit, Blob Hit, Ogre hit
- Ogre Treasure
- Blob Potion
- Blob Combine
- Javelin Throw
- Collect Treasure
- Consume Potion
- Trigger Trap
- Use Portal
- End Turn
- Die
- Reach Stairs

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Player Archetypes

For this study, players were divided into three archetypes.

1. Runner
2. Monster Killer
3. Treasure Collector

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Synthetic Data

- Artificial agents were Best First Search agents, which use utility functions to take after a Player Persona.
- Agents Perform online move planning.
- 25% chance of random action
- Each agent uses a heuristic unique to it.

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Human Data

- Questionnaire
- Gameplay session

- Not all users filled in the questionnaire but had gameplay submissions.

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(a) Map 100

(b) Map 101

(c) Map 102

(d) Map 201

(e) Map 202

Fig. 1: User study maps used to generate playtrace datasets

Experiment

- Five hand-designed maps were developed
- Each agent had 1.0 seconds to plan before making a move.
- Each agent ran 100 times on five maps.
- 1500 total runs.

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Models

- Two models Were trained
  - Long Short-Term Memory Model
    - Trained on cropped play traces
  - Support Vector Machine Model
    - Trained on mechanic frequencies.

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Results

- LTSM and SVM

Model	*Training Set*	*Training*	*Validation*	*Testing*
LSTM	*Synthetic*	0.581 ± 0.047	0.483 ± 0.08	0.186 ± 0.029
	Human SL	0.563 ± 0.016	0.48 ± 0.112	0.187 ± 0.014
	Human AAR	0.837 ± 0.03	0.784 ± 0.067	**0.726 ± 0.029**
SVM	*Synthetic*	0.596	0.567	0.048
	Human SL	0.43	0.359	0.259
	Human AAR	0.777	0.694	**0.700**

The training, validation, and testing results for the LSTM and SVM trained on different datasets/labels

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Results

- Players Can’t identify themselves correctly

		Self-Percieved	
		Yes	No
AAR	Yes	29.6%	40.0%
	No	12.7%	17.7%

(a) Runner

		Self-Percieved	
		Yes	No
AAR	Yes	29.0%	20.7%
	No	20.2%	30.1%

(b) Treasure Collector

		Self-Percieved	
		Yes	No
AAR	Yes	18.4%	16.8%
	No	32.7%	32.0%

(c) Monster Killer

The agreement and disagreement between Self-Perceived labels and the AAR labels for every persona

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Results

- The analysis of play traces revealed the presence of a fourth persona not measured in the questionnaire and a sizable group of players classified as all three persona types.
- Models trained on self-perception human data sets performed poorly.
- Models trained on AAR labelled human data set performed well.

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Future Work / Potential of this study.

- This Data and methods/ approach can be used to create NPC AI for a different type of NPCs.

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Refrances.

- Green, M. C., Khalifa, A., Charity, M., Bhaumik, D., & Togelius, J., 2022. Predicting Personas Using Mechanic Frequencies and Game State Traces. In 2022 IEEE Congress on Evolutionary Computation (CEC) (pp. 1-8). IEEE.
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