

# Breakfastclub

How Personality Traits effect attention and happiness in a simulated classroom

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How different personalities effect  
classroom attention and happiness?

# Master Thesis - Objectives

- Developing a deterministic closed loop simulation.
- Basing agent behavior on establish psychological personality theory model.
- Compare how different personality profiles effect agent and group behavior.

# Content

- What is an Agent based model?
- How to base agent behavior on models from human personality theory?
- The Simulation
- Experiment & Results

# Agent based models

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An **agent-based model (ABM)** is a class of computational models for simulating the actions and interactions of autonomous agents (both individual or collective entities such as organizations or groups) with a view to assessing their effects on the system as a whole.

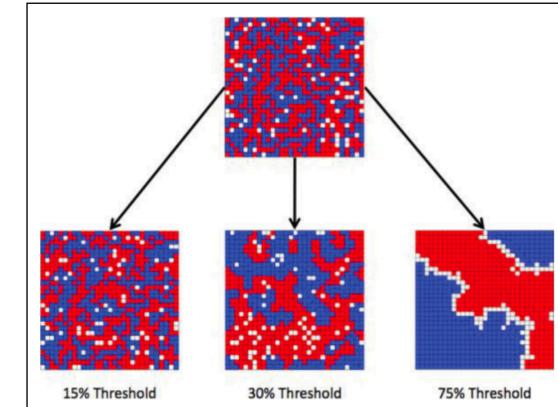
- Wikipedia

Applied in various fields

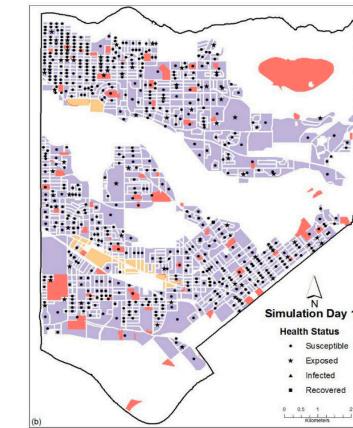
- Biology (e.g. epidemics)
- Economics (e.g. Stock Trade)
- Social Studies (e.g. Social Networks)

# Agent based models - Examples

Thomas Schelling's (1971) – Social Segregation [1]



Perez (2009) – Contagious disease spread [2]



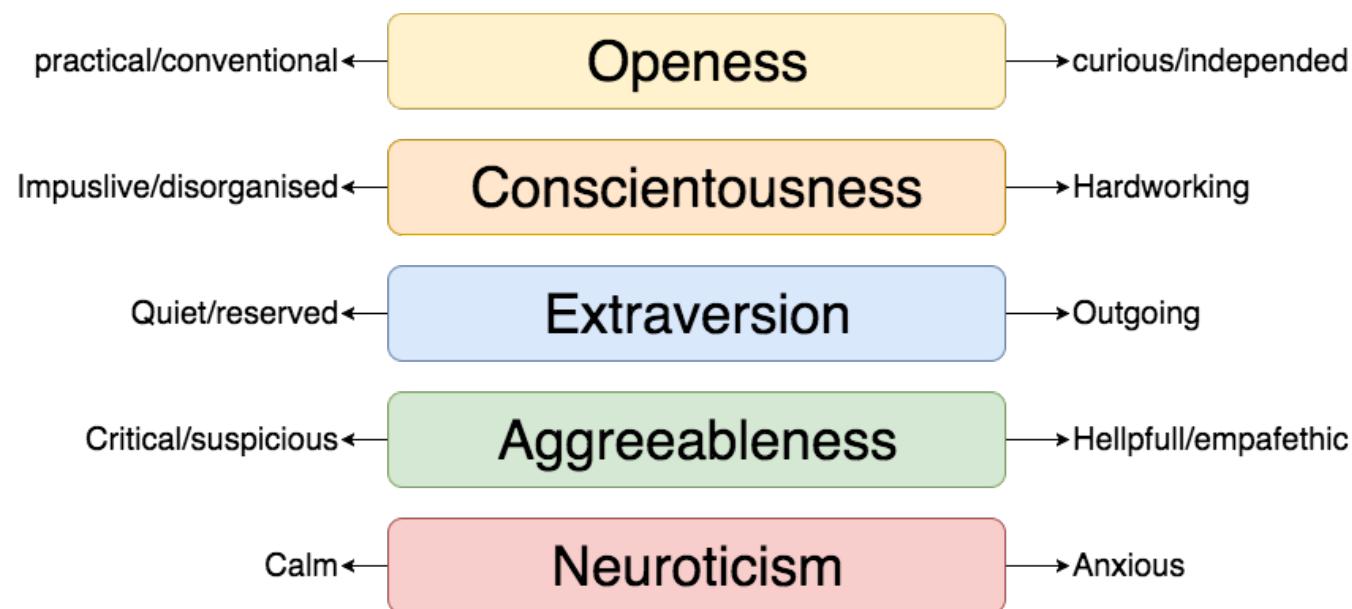
- [1] Schelling, T. C. (1971). Dynamics Model of Segregation. *Journal of Mathematical Sociology*, 1(May 1969), 143–186.
- [2] Perez, L., & Dragicevic, S. (2009). An agent-based approach for modeling dynamics of contagious disease spread. *International Journal of Health Geographics*, 8(1), 1–17. <https://doi.org/10.1186/1476-072X-8-50>

How to base agent behavior on models from  
human personality theory?

# Big Five – Personality Trait Model

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Controversial but widely applied in theoretical and practical settings is the empirical OCEAN or Big Five Personality Trait model[1].



[1] Norman, W. T. (1963). Toward an adequate taxonomy of personality attributes. *Journal of Abnormal and Social Psychology*, 66(6), 574–583. <https://doi.org/10.1037/h0040291>

# Big Five in the classroom

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- Empirical studies show how the big five effect the behavior or children in the classroom [1]
- On school achievements and outcome [2]
- Big Five in children with ADHD [3]

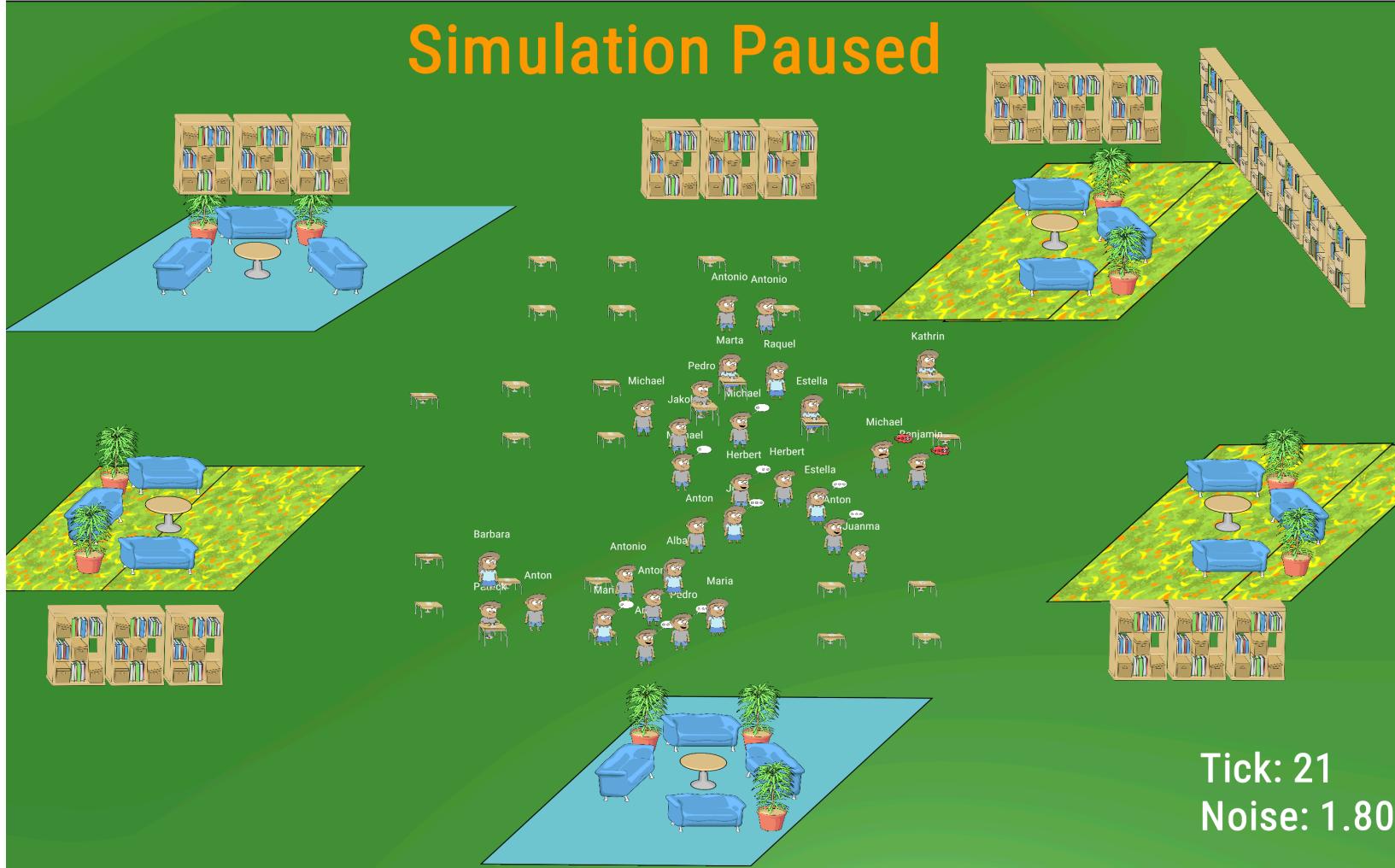
[1] Ehrler, D. J., Evans, J. G., & McGhee, R. L. (1999). Extending Big-Five theory into childhood: A preliminary investigation into the relationship between Big-Five personality traits and behavior problems in children. *Psychology in the Schools*

[2] Asendorpf, J. B., & Van Aken, M. A. G. (2003). Validity of Big Five Personality Judgments in Childhood: A 9 Year Longitudinal Study. *European Journal of Personality*, 17(1), 1–17. <https://doi.org/10.1002/per.460>

[3] Nigg, J. T., Blaskey, L. G., Huang-Pollock, C. L., Hinshaw, S. P., John, O. P., Willcutt, E. G., & Pennington, B. (2002). Big five dimensions and ADHD symptoms: Links between personality traits and clinical symptoms. *Journal of Personality and Social Psychology*, 83(2), 451–469. <https://doi.org/10.1037/0022-3514.83.2.451>

How to build a agent based model of a virtual classroom based on the Big Five?

# Breakfastclub



- Agent based model implemented in Unity3D
- Agent behavior is based on OCEAN (Big Five) Personality Trait model
- Models attention, happiness and motivation

# Agent based models

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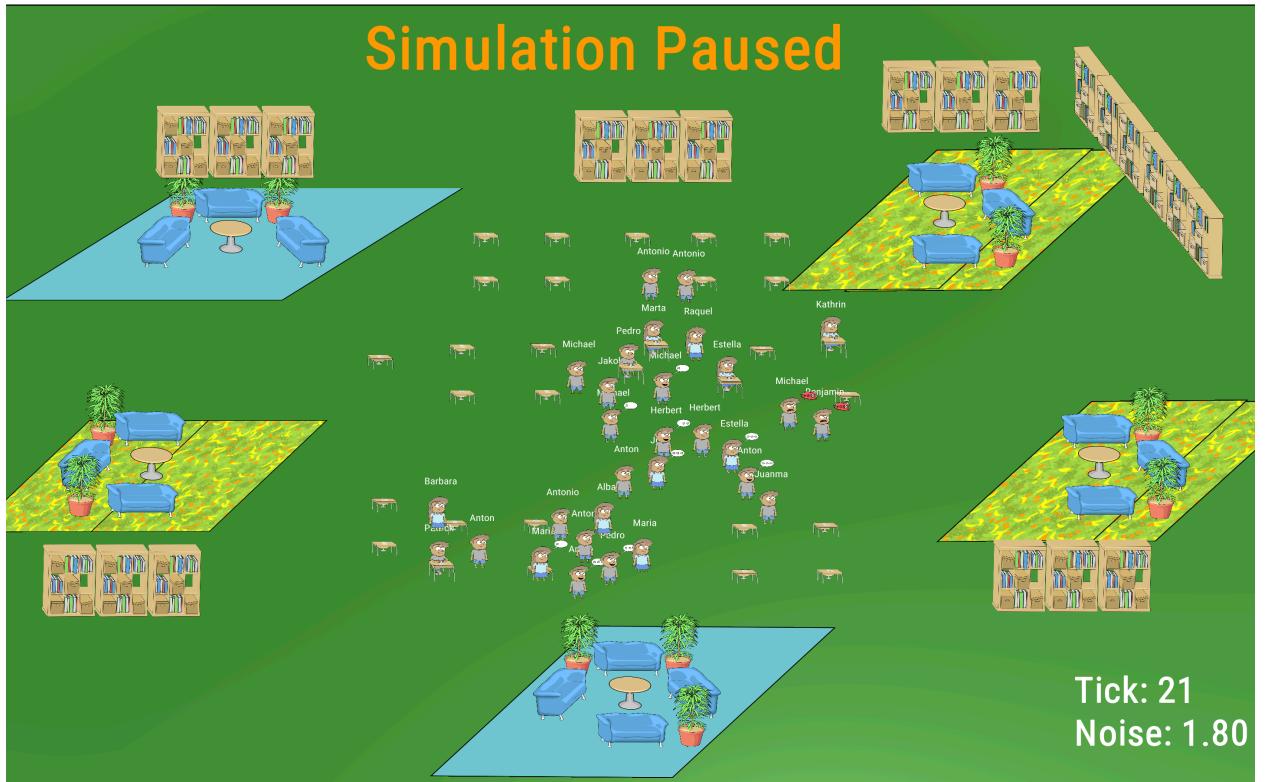
## Main Components

- Environment (i.e. define the classroom)
- Agents (i.e. possible behavior and characteristics)
- Logic (i.e. how to select and control behavior)

# Environment

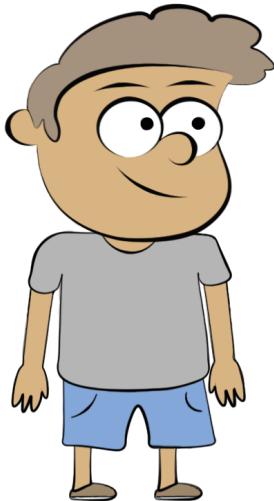
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- Number of Students
- Individual/Group tables



# The Agents

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## Personality

- Openness
- Conscientiousness
- Extraversion
- Agreeableness
- Neuroticism

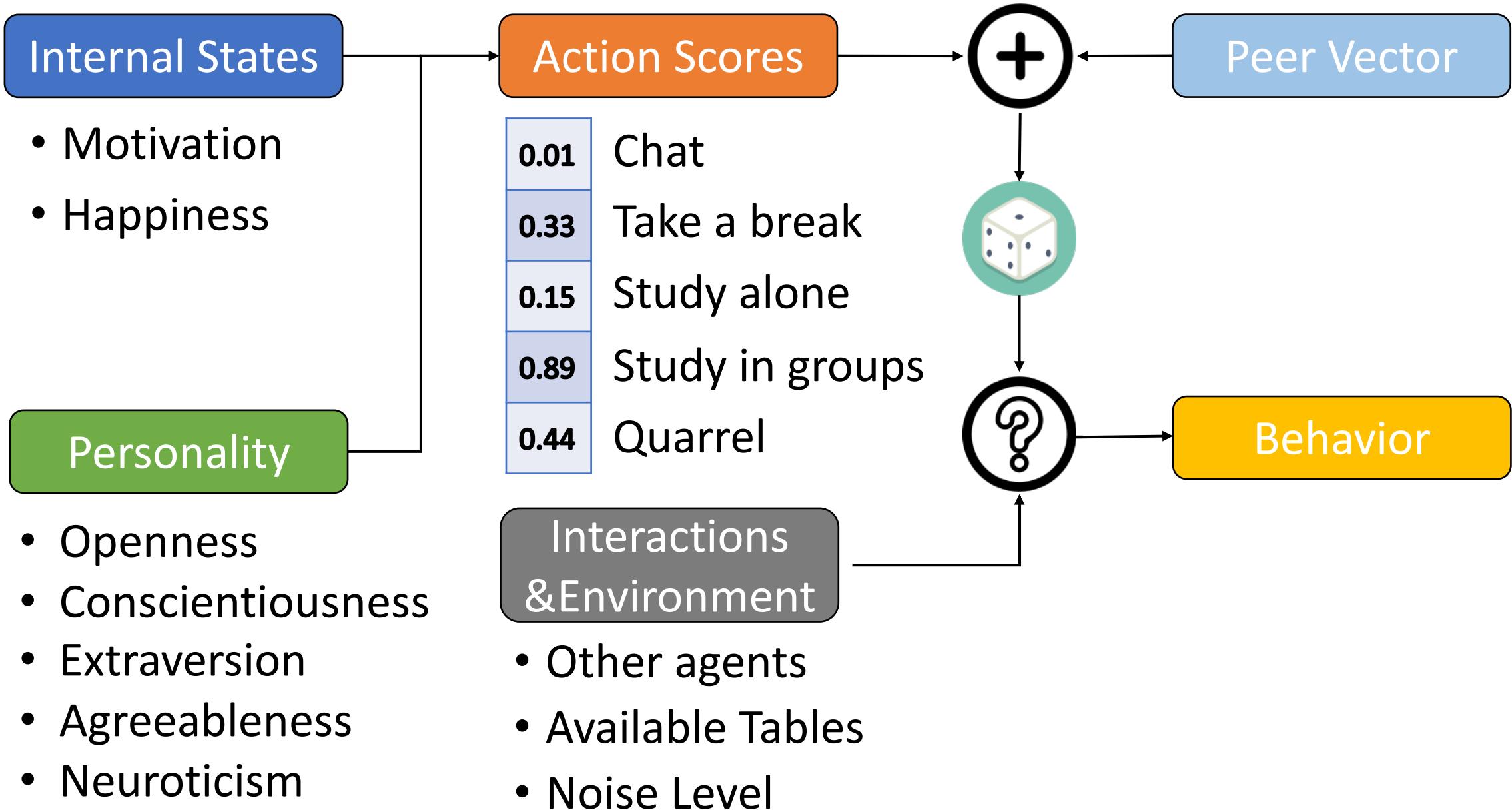
## Internal States

- Motivation
- Happiness
- Attention

## Behavior

- Chat
- Take a break
- Study alone
- Study in groups
- Quarrel

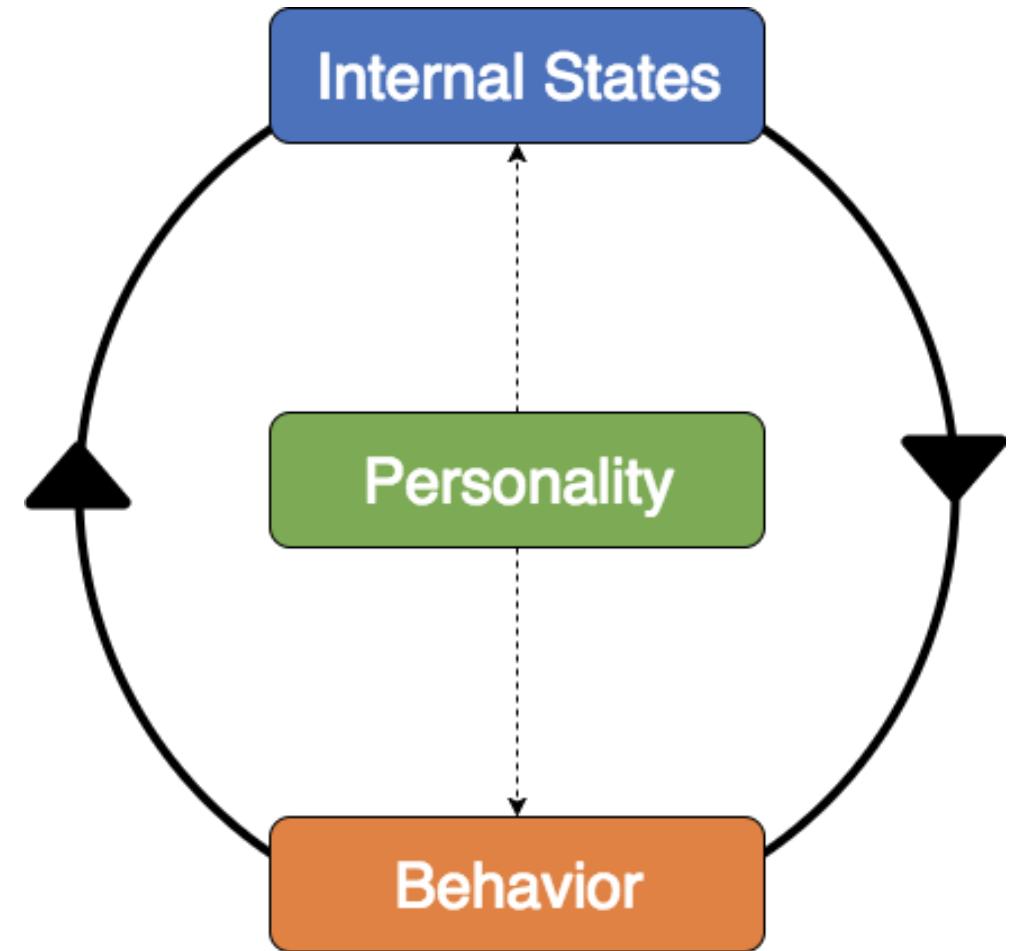
# Logic



# Agent Dynamics

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- Each Agent is a dynamic system
- Parameterized by its Personality Traits
- Internal States define and are altered by Agents Behavior

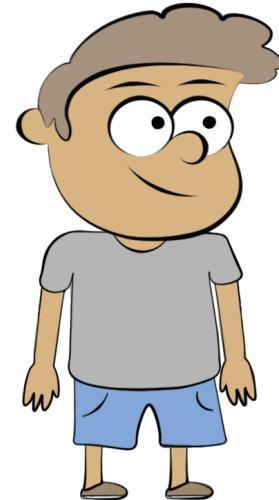


# Sources of Agent Behavior

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Internal States

Environment



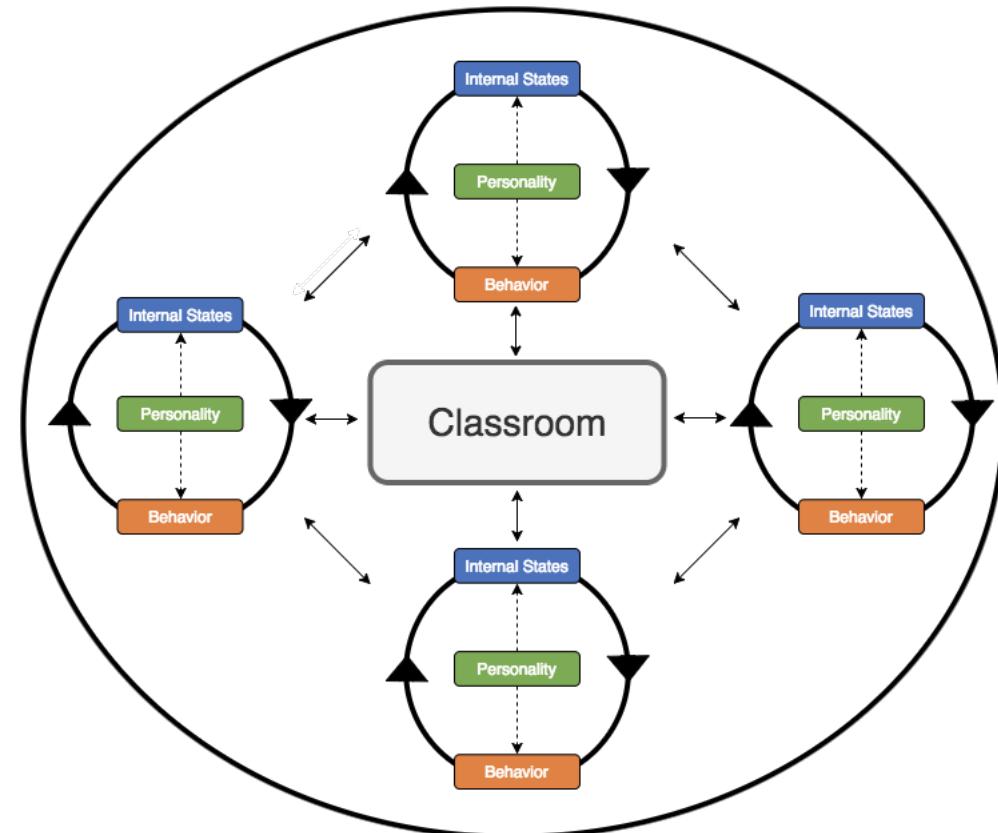
Peer Pressure

Interactions

# Group Dynamics

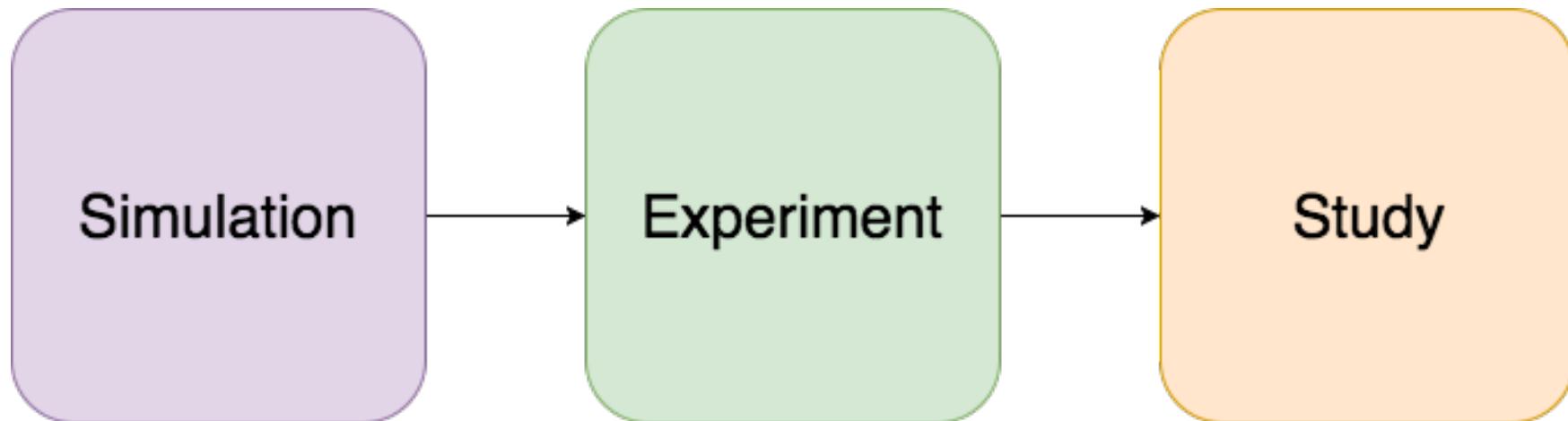
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- Agents interact with each other and the environment
- Different Agent Ensembles have different Group dynamics
- The system can cause emerging behaviors



# Three phase Analysis

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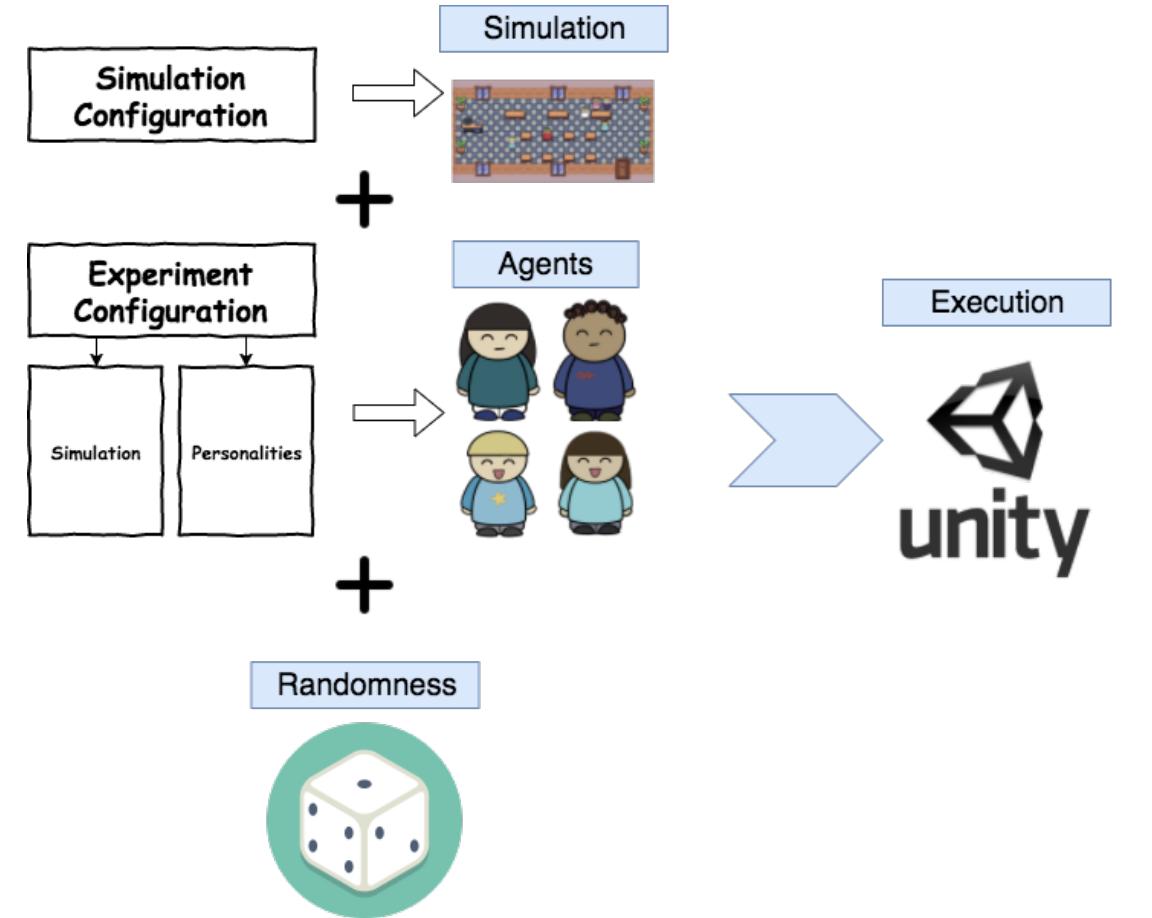
What is the behavior of one set of agents?

What is the average happiness and attention of a combination of personalities?

How do different personality combinations compare to each other?

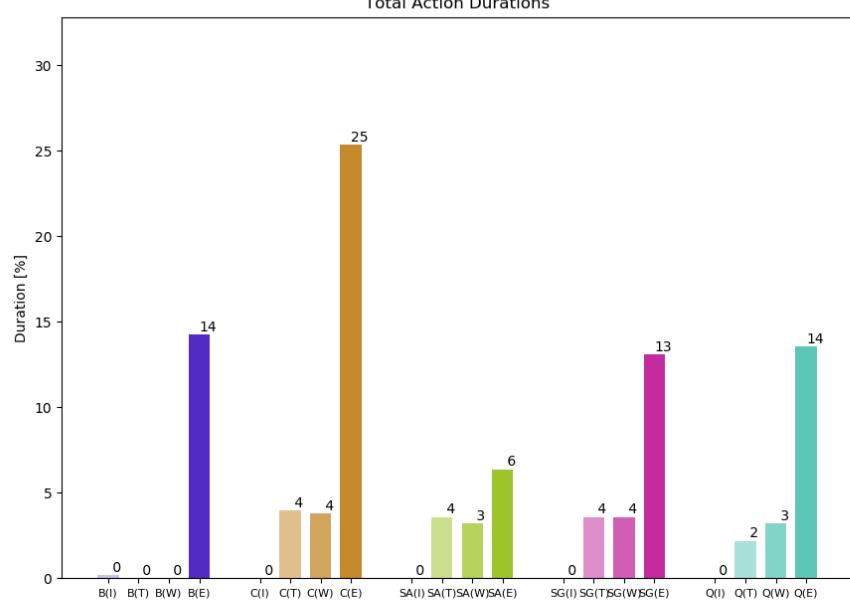
# Simulation

What is the behavior of one set of agents?

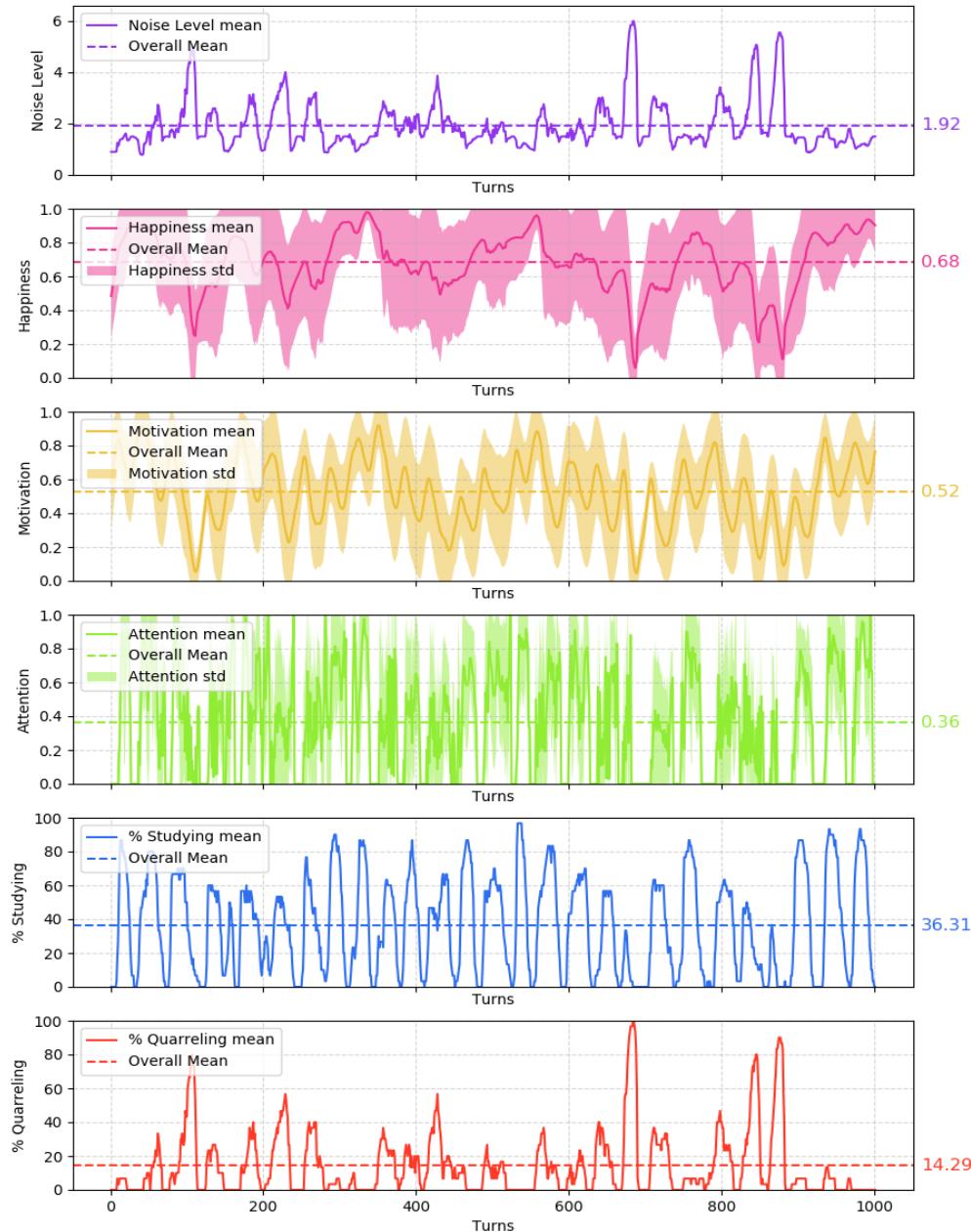


# Agent Info

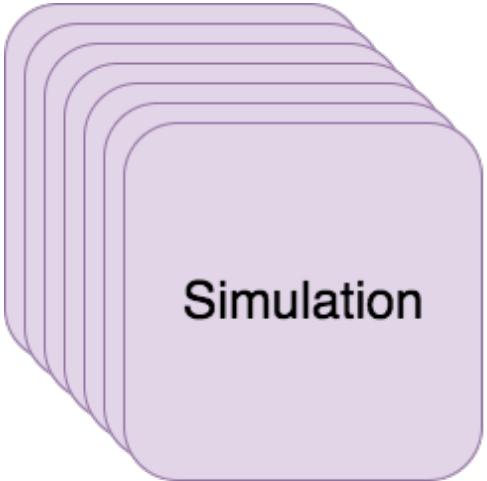
Normal: Openness: 0.75, Conscientiousness: 0.6, Extraversion: 0.55, Agreeableness: 0.65, Neuroticism: 0.5



# Classroom Info

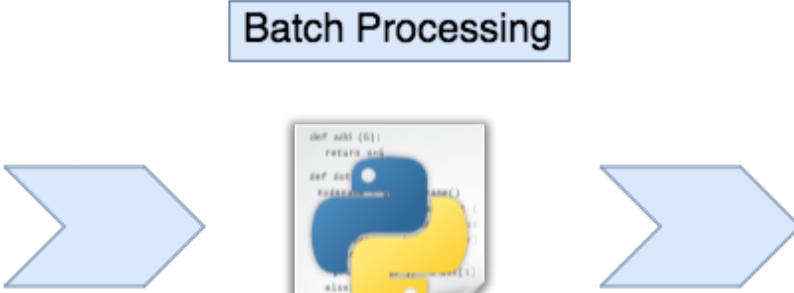


# Experiment



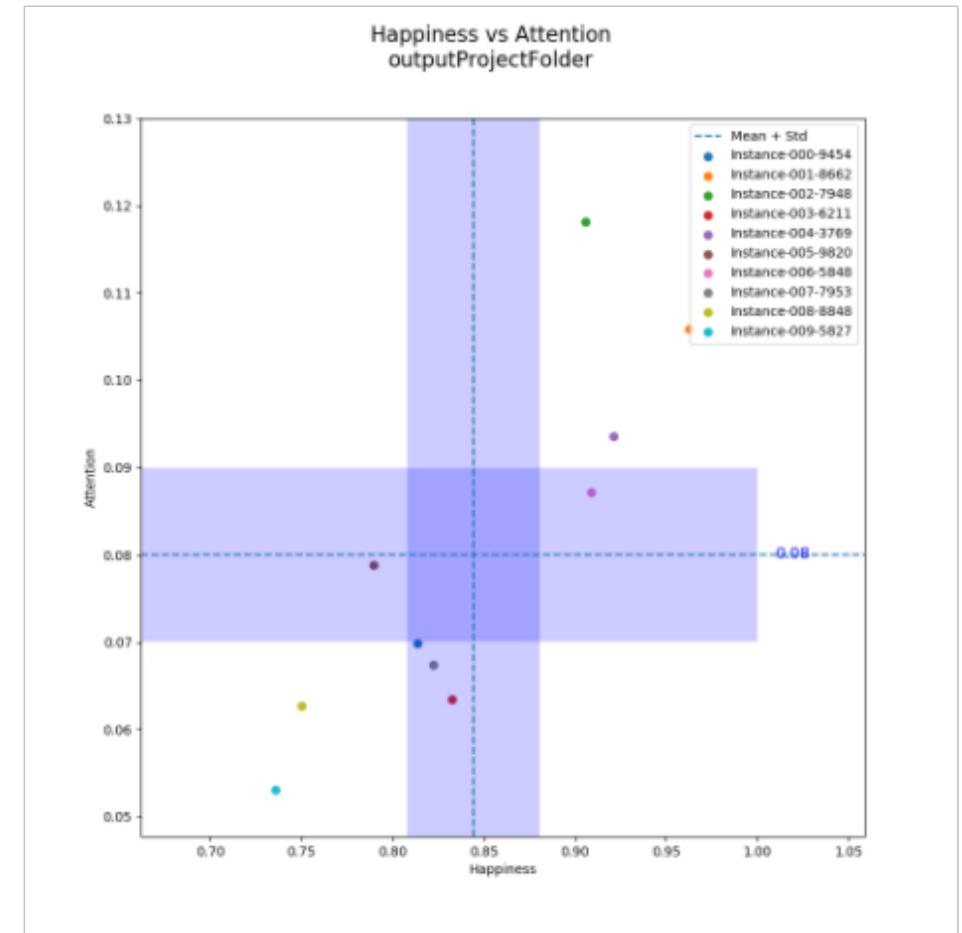
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Randomness



What is the average happiness and attention of a combination of personalities?

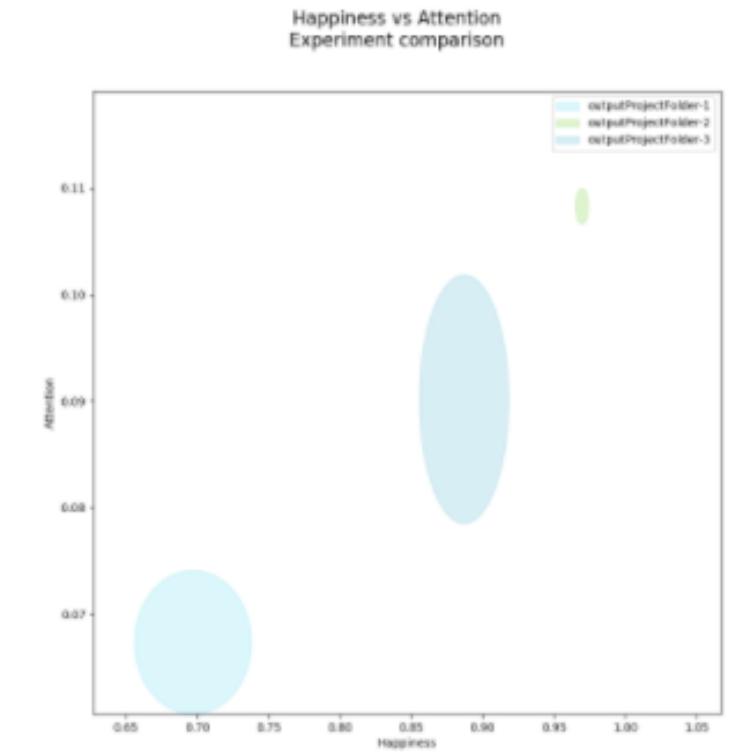
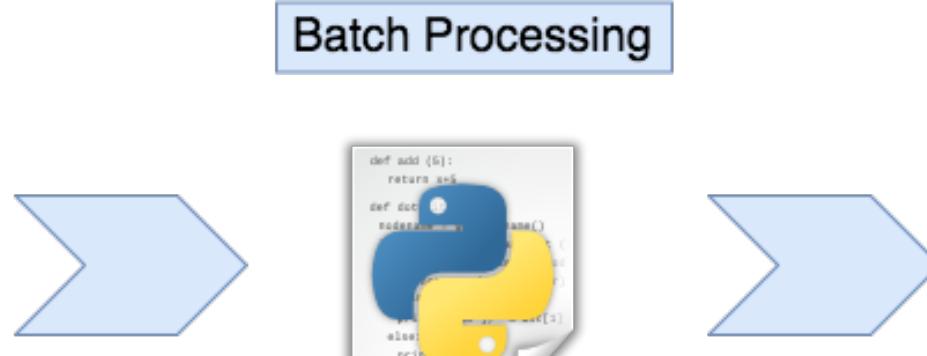
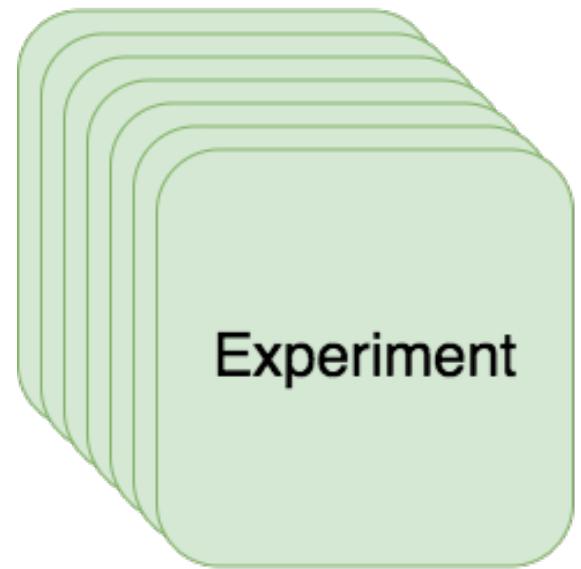
Average



# Study

How do different personality combinations compare to each other?

Group comparison



# Testing the simulation

How different personalities effect classroom  
attention and happiness?

# Experiments & Results

# Experiment - Setup

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1. Define different Student Types (Personality Trait Profiles)
2. Define Classrooms with different Student Type Distributions
3. Run multiple simulations per Classroom
4. Compare groups

# Experiment

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## Personality Profiles

Student Type	O	C	E	A	N
ADHD	RND	0.20	RND	0.20	0.80
Normal	0.75	0.60	0.55	0.65	0.50
Ambitious	0.80	0.80	RND	0.80	0.20
Random	RND	RND	RND	RND	RND

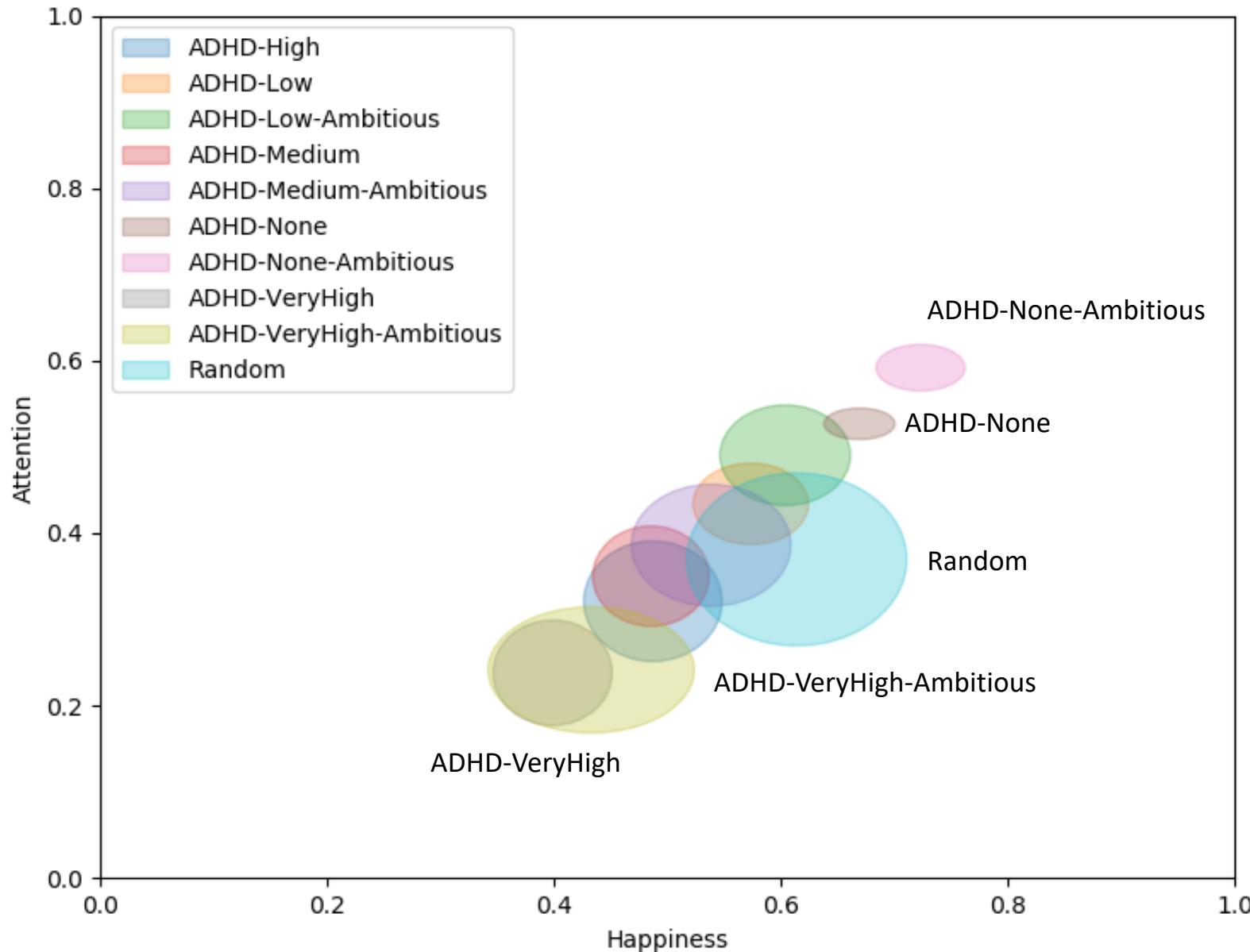
## Classroom Profiles

Group	ADHD	Normal	Ambitious	Random
ADHD-Low	7%	93%	0%	0%
ADHD-Medium	17%	83%	0%	0%
ADHD-High	33%	66%	0%	0%
ADHD-VeryHigh	50%	50%	0%	0%
ADHD-None	0%	100%	0%	0%
ADHD-None-Ambitious	0%	50%	50%	0%
ADHD-Low-Ambitious	7%	46%	46%	0%
ADHD-Medium-Ambitious	20%	40%	40%	0%
ADHD-VeryHigh-Ambitious	50%	0%	50%	0%
Random	0%	0%	0%	100%

[1] Nigg, J. T., Blaskey, L. G., Huang-Pollock, C. L., Hinshaw, S. P., John, O. P., Willcutt, E. G., & Pennington, B. (2002). Big five dimensions and ADHD symptoms: Links between personality traits and clinical symptoms. *Journal of Personality and Social Psychology*, 83(2), 451–469.  
<https://doi.org/10.1037/0022-3514.83.2.451>

# Results

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# Result interpretation

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1. ADHD and ambitious students, move average group happiness and attention in opposite directions
2. ADHD students have a far strong effect on the group than ambitious students

# Conclusion

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1. It is possible to build an agent based model of a virtual classroom
2. Agent behavior is strongly effected by Personality Profile
3. Simulating different classrooms profiles produce consistent behavior

Prof. Dr. Michael Kickmeier-Rust  
(Supervisor)



Prof. Elena Verdu Perez  
(Supervisor)



Felix Meissl  
(Art Work)



Thank you

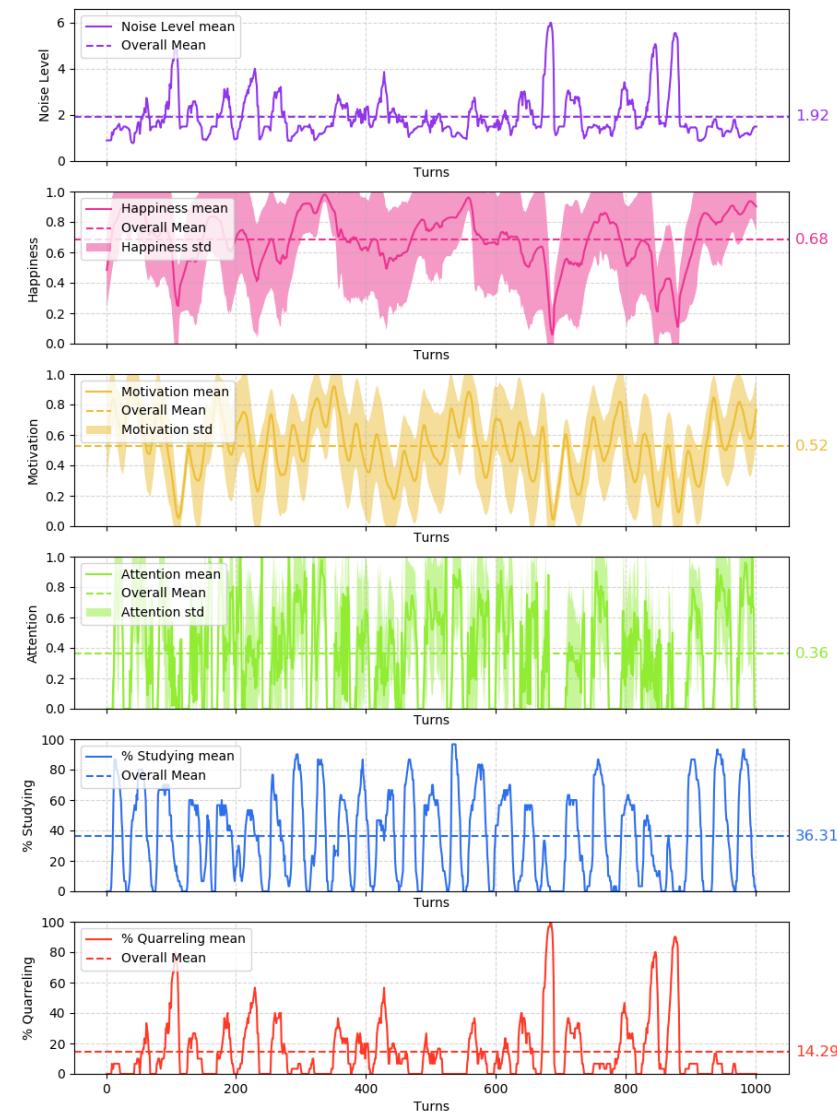


# Outlook

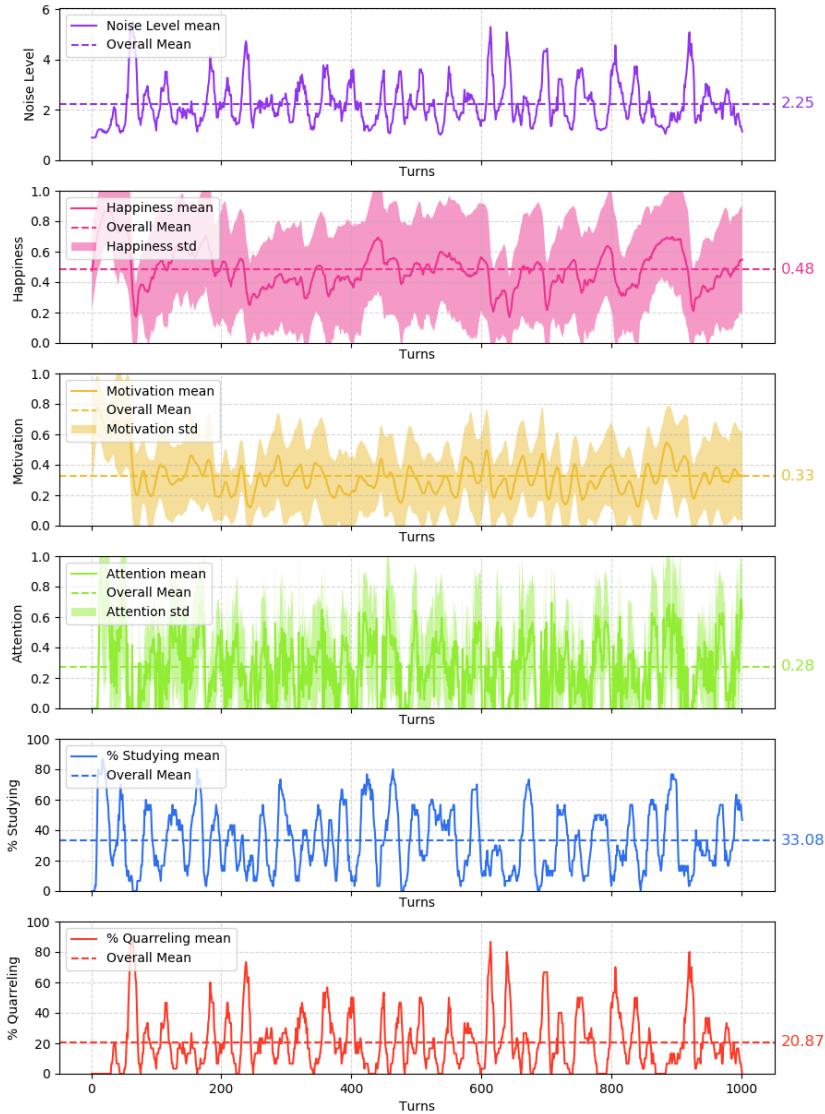
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1. Improve classroom aggregates analysis
2. Interactive Simulation
3. Include a Teacher Agent

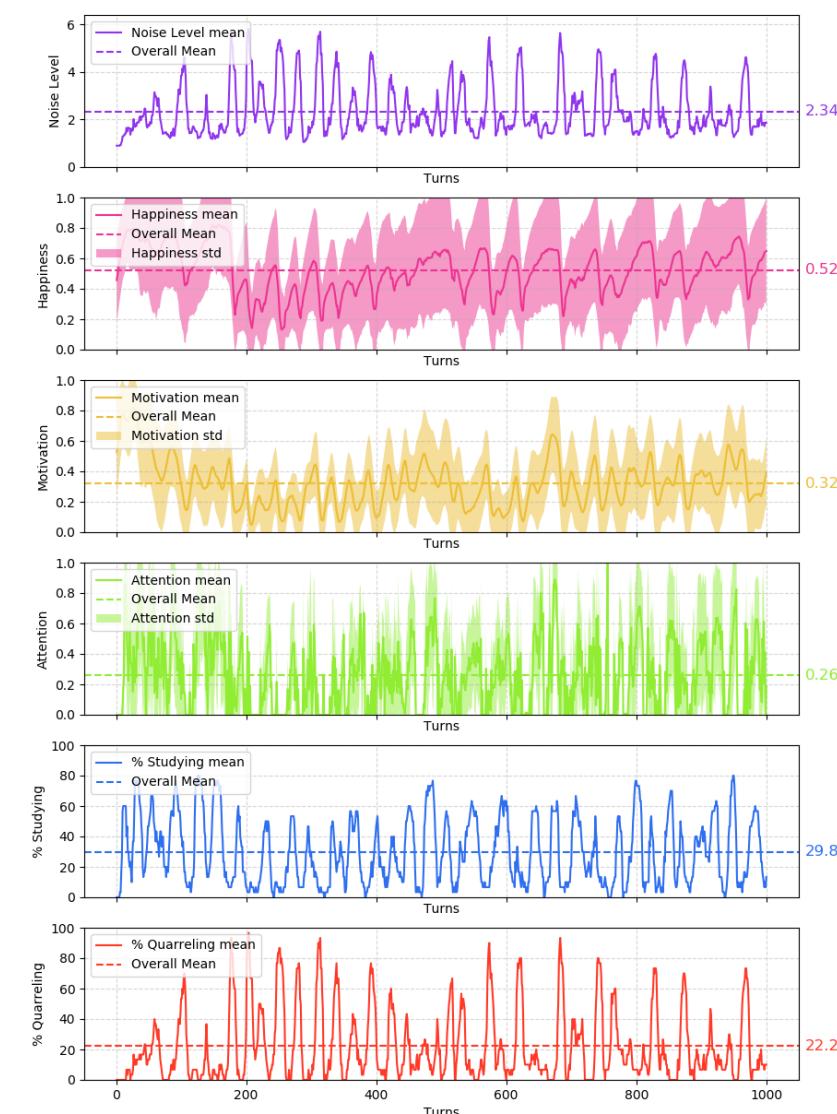
## ADHD-None



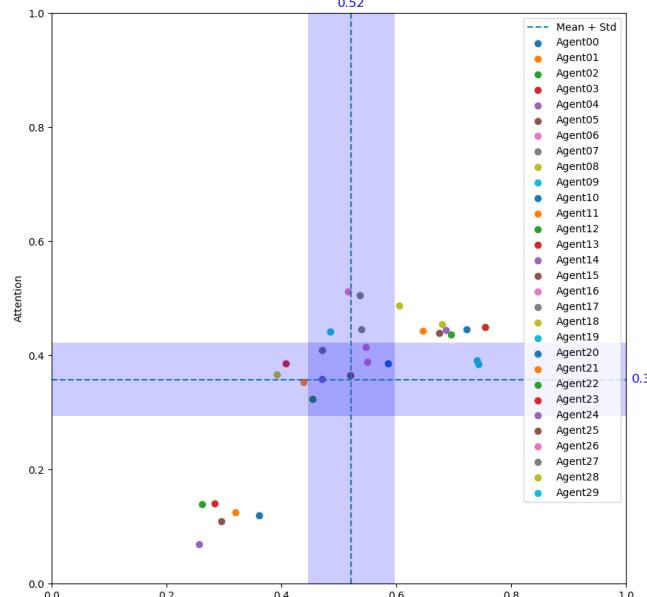
## ADHD-Medium



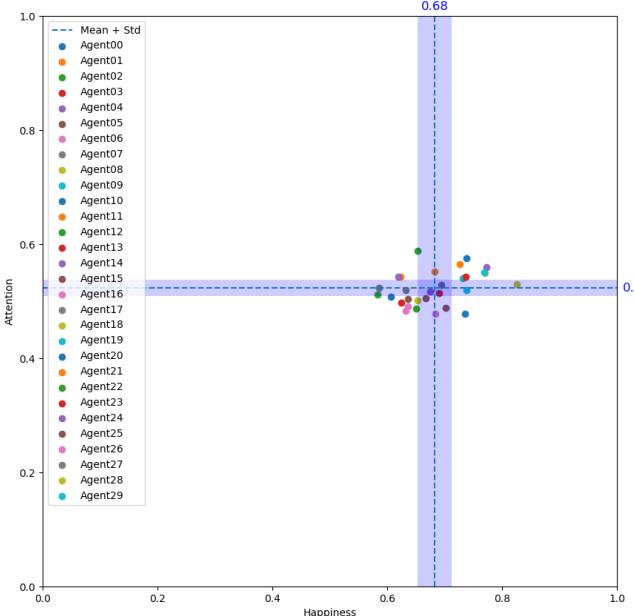
## ADHD-Medium-Ambitious



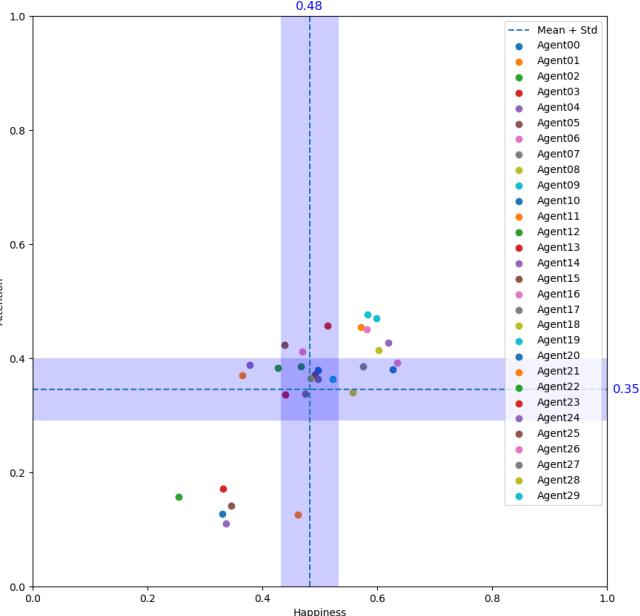
# ADHD-Medium-Ambitious



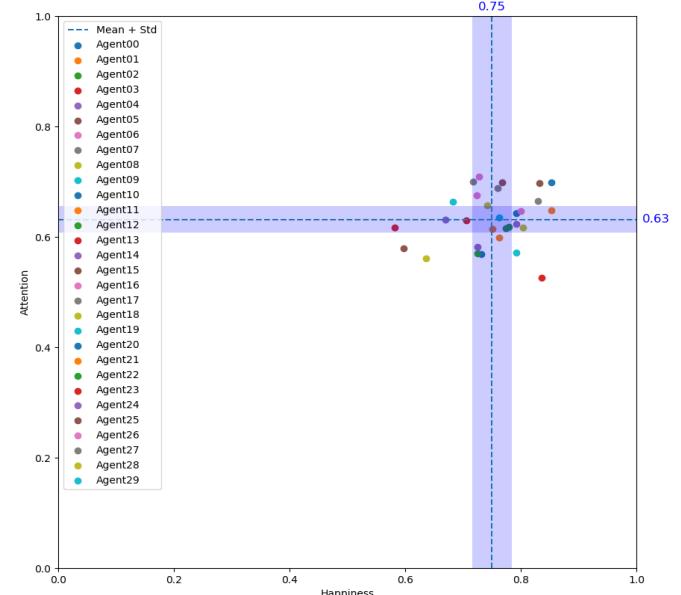
# ADHD-None



# ADHD-Medium



# ADHD-None-Ambitious



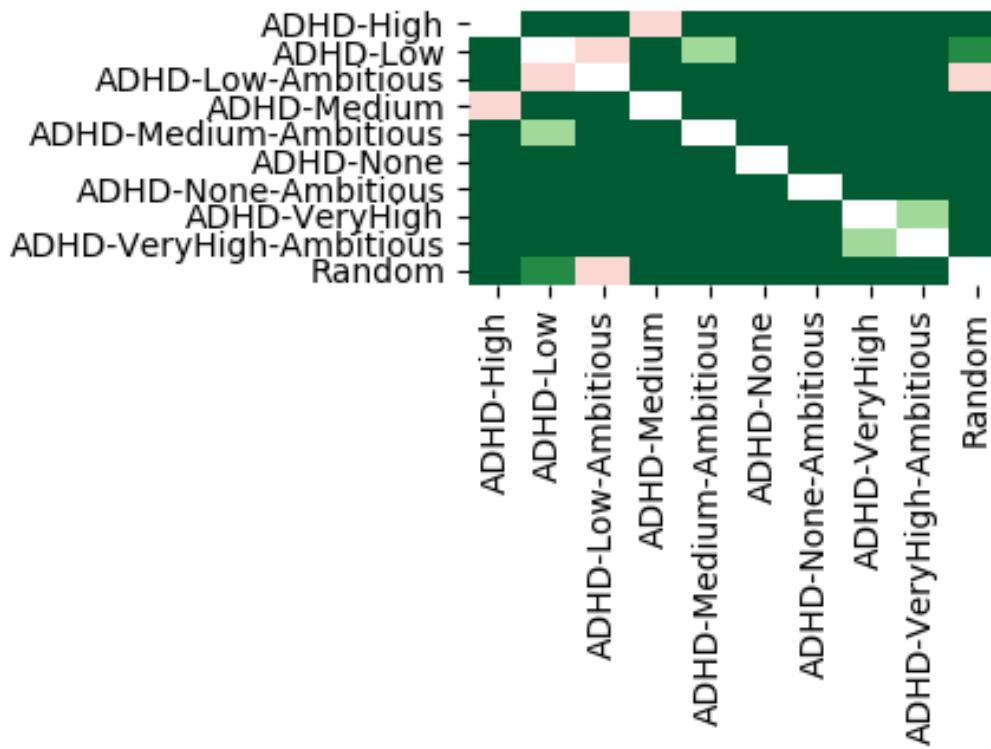
### Spearman Rank-Order correlation

	Happiness	Attention
conformity	0.66	0.60
Openness	0.29	0.32
Conscientiousness	0.53	0.71
Extraversion	-0.09	0.05
Agreeableness	0.61	0.53
Neuroticism	-0.70	-0.54
Attention	0.66	1.00
Happiness	1.00	0.66

MANOV Significance ( $p < 0.05$ )  
 Happiness: True  
 Attention: True



### Happiness



### Attention

