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**Graduate Research Symposium 2013**

**Title**

Performatology: A Computational Framework for Modeling Artistic Gesture (Masters Thesis Research in Computer Science, Advisor: Arnav Jhala).

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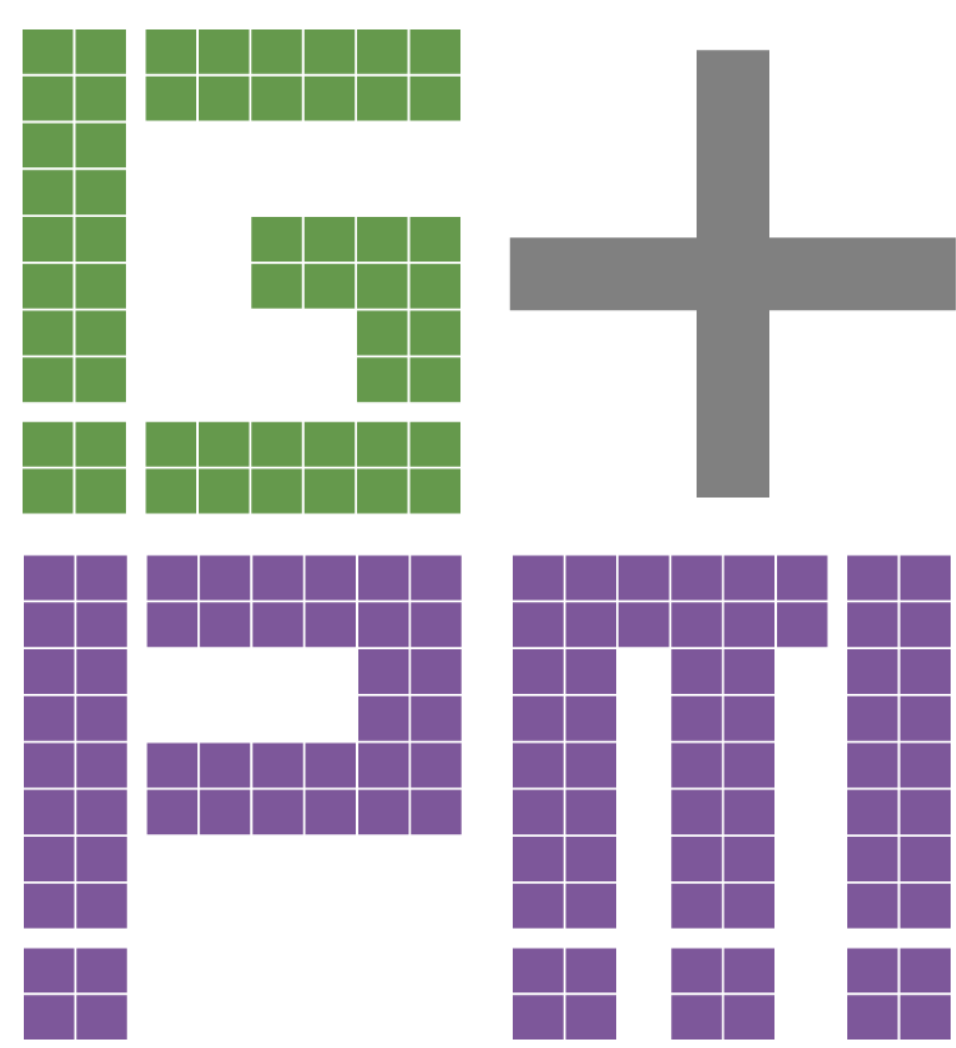
Maraffi, Christopher

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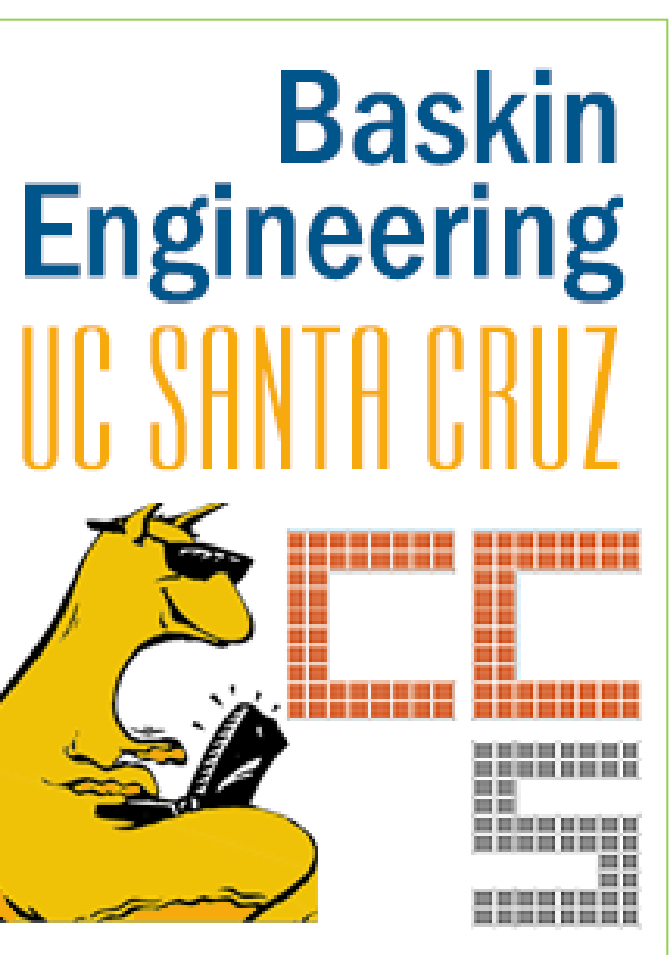




# Performatology: A Computational Framework for Modeling Artistic Gesture

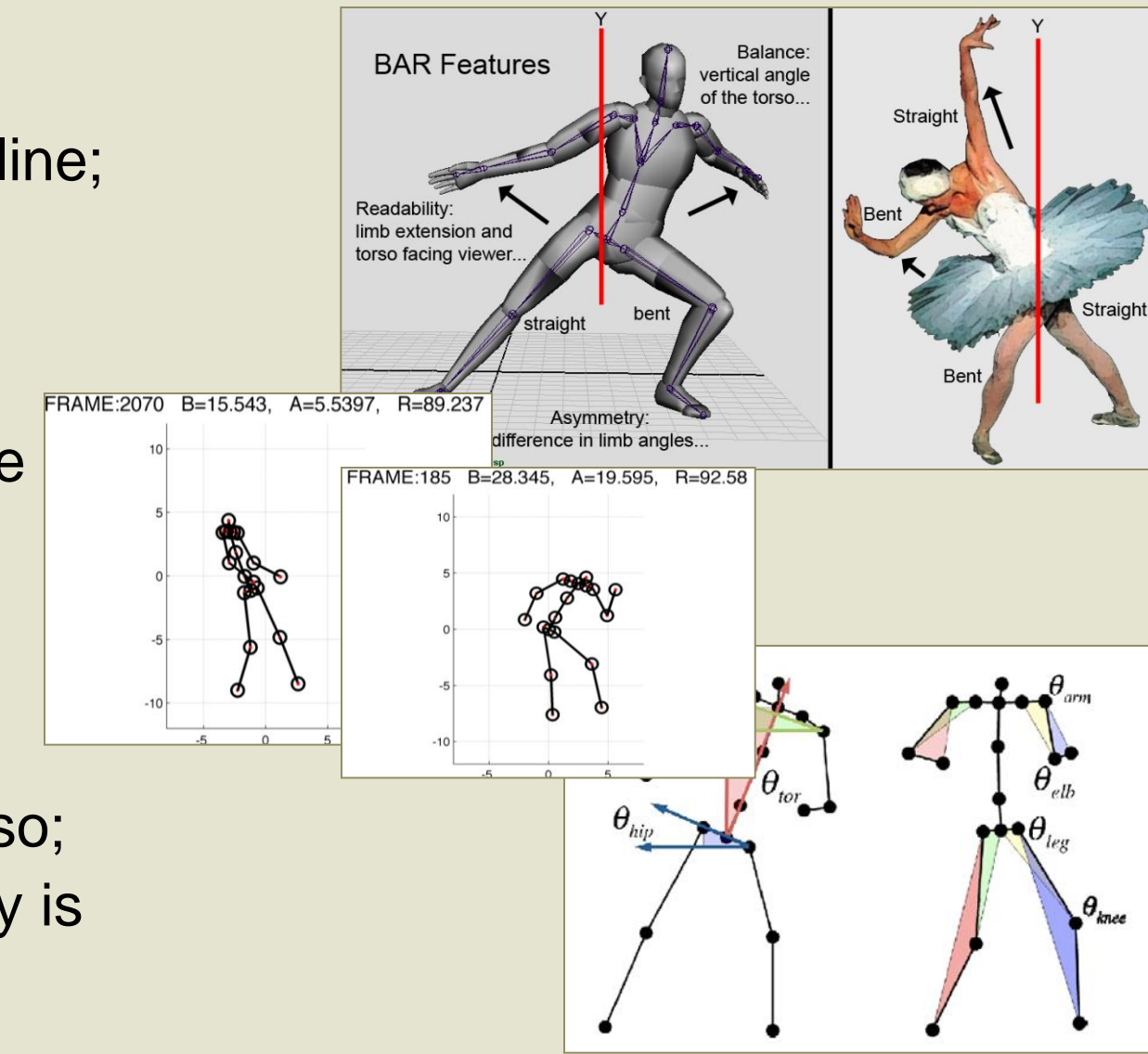
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CS PhD Advisor: Arnav Jhala, Computational Cinematics Studio, 2013



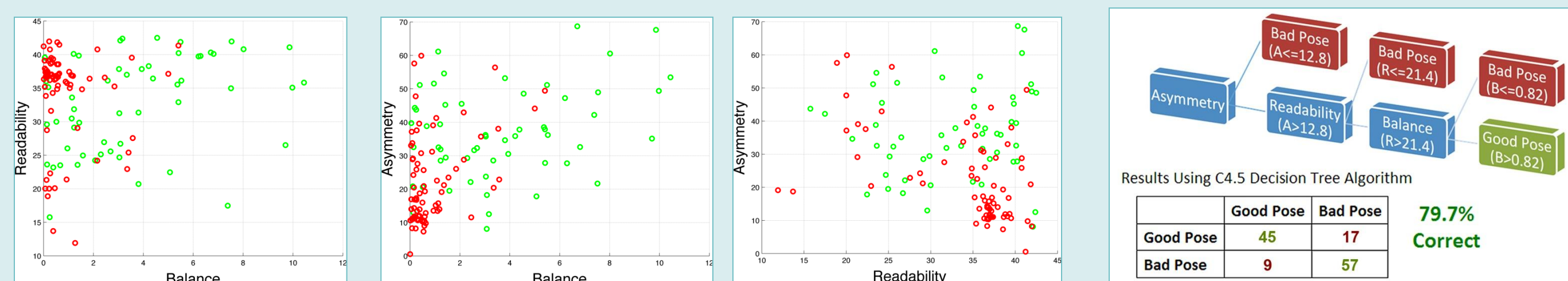
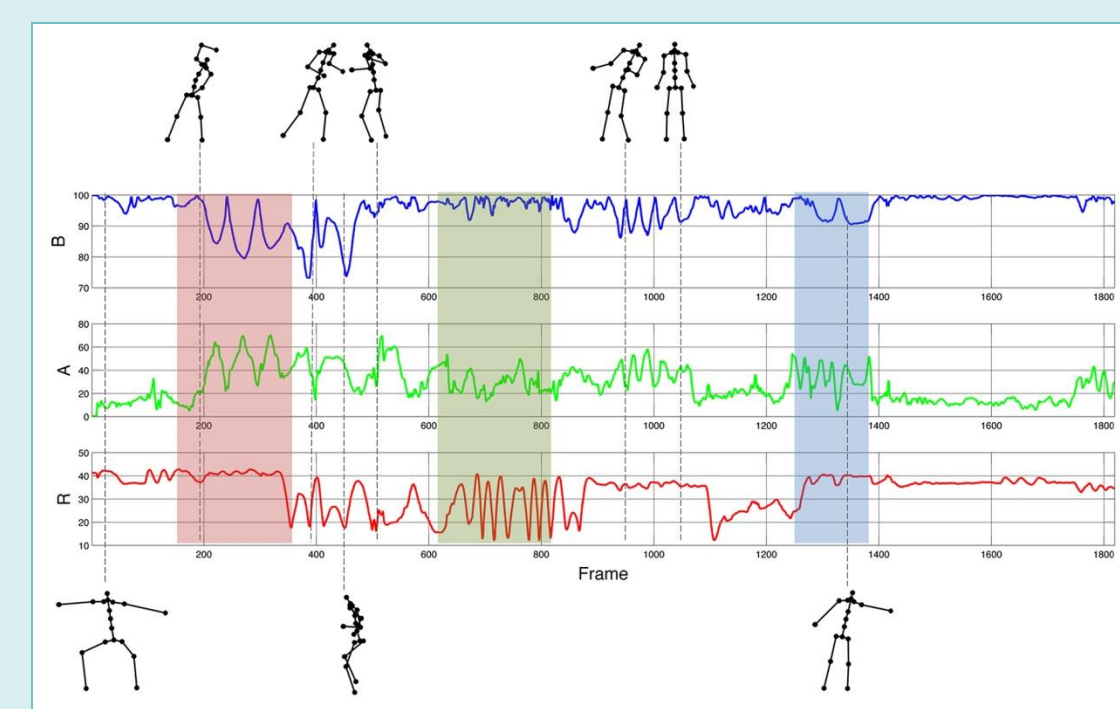
## Feature Selection & Metrics

- Balance:**
  - Skill in articulating the *torso* angle off the center line;
  - creates the impression of movement in the torso posture.
- Asymmetry:**
  - Skill in articulating the *limbs* differently across the center line;
  - Mirroring is minimized while visual information is maximized.
- Readability:**
  - Skill in composing the limbs in relation to the torso;
  - Occlusions are minimized while pose intelligibility is maximized for viewer.



## Pilot Study

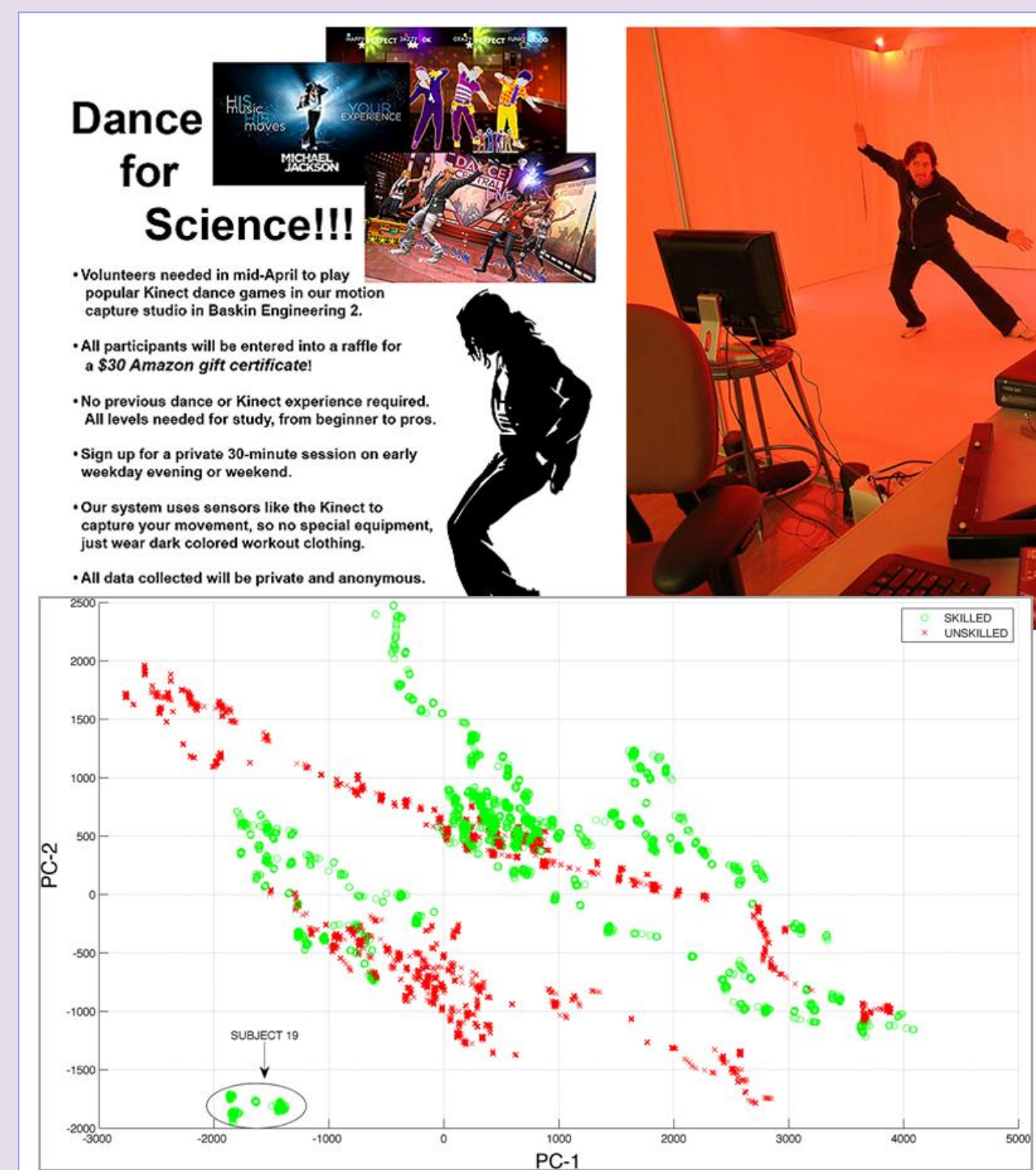
- C4.5 decision tree implementation in the Weka machine learning library to learn the performers preferences given binary ratings for each pose along with its BAR features.
- Using a 10-fold cross-validation procedure, the resulting decision tree was able to rate "unseen" poses with an accuracy of 79.7 percent.



Results Using C4.5 Decision Tree Algorithm	Good Pose	Bad Pose	Correct
Good Pose	45	17	79.7% Correct
Bad Pose	9	57	

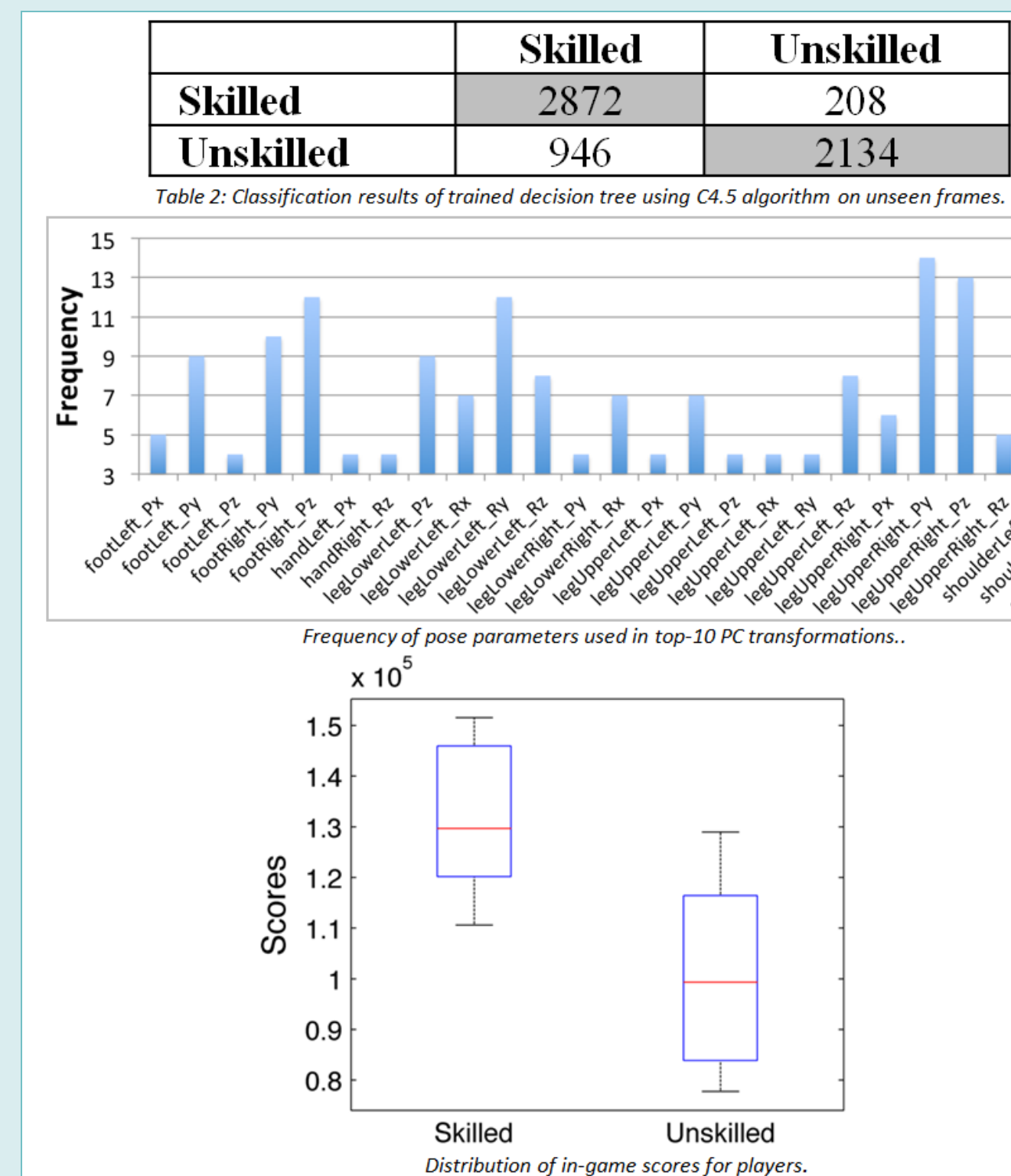
## Dance for Science! (DFS)

- Setup:** Participants played Michael Jackson Experience (MJE) Kinect game on a markerless Organic Motion mocap stage, skeletal data captured into Motion Builder.
- Data:** 20 performances by male and female dancers age 18-47, a practice session followed by main dance, high game scores recorded, 4-choice self survey classified as 10 skilled and 10 unskilled dancers.
- Analysis:** Principal component analysis was done using our BAR metrics and 114 pose parameters.



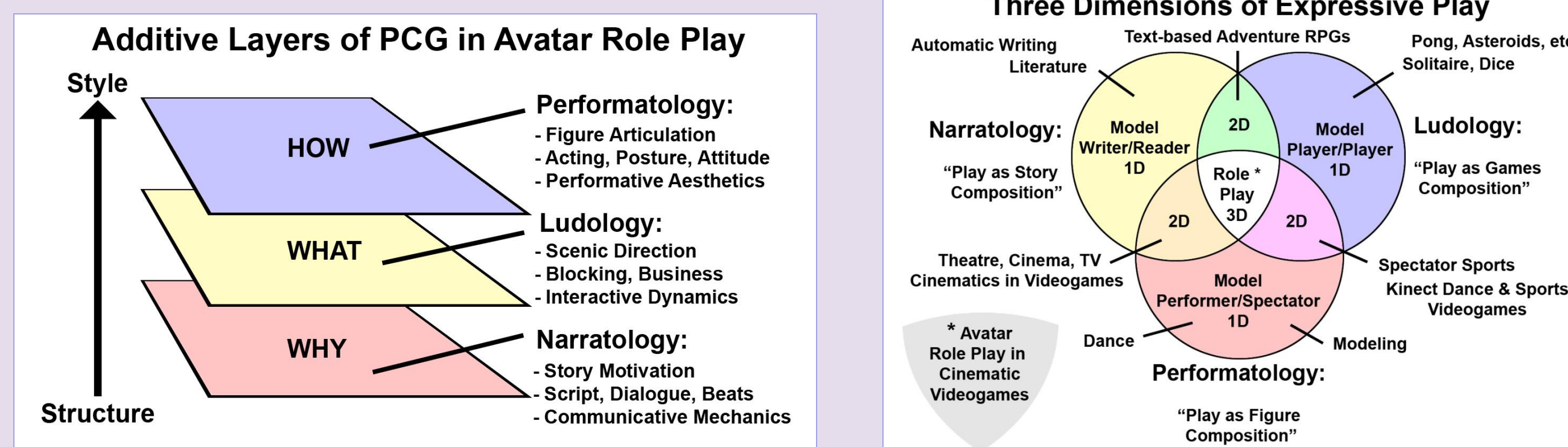
## DFS Experimental Results

- A C4.5 decision tree classifier was trained on half the data of skilled/unskilled performers.
- Predicted the skill level of the remaining (unseen) performers' poses with up to 81.3 percent accuracy.
- The top-ten PCs were used, collectively representing 99.6 percent of the overall data variance.
- A two-tailed test showed that performers who were considered "unskilled" and "skilled" had game scores from two distinct distributions (p-value = 0.0016)



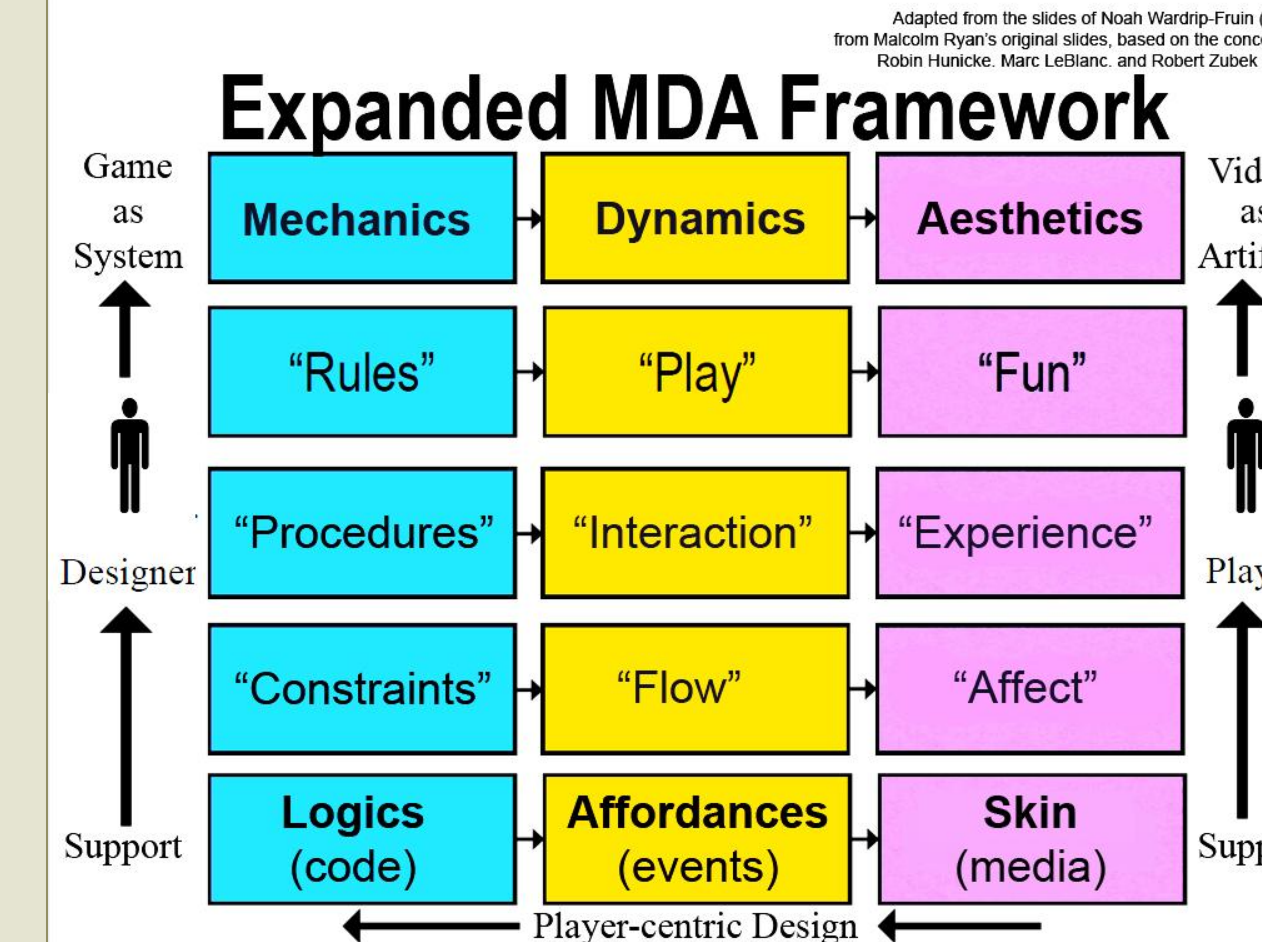
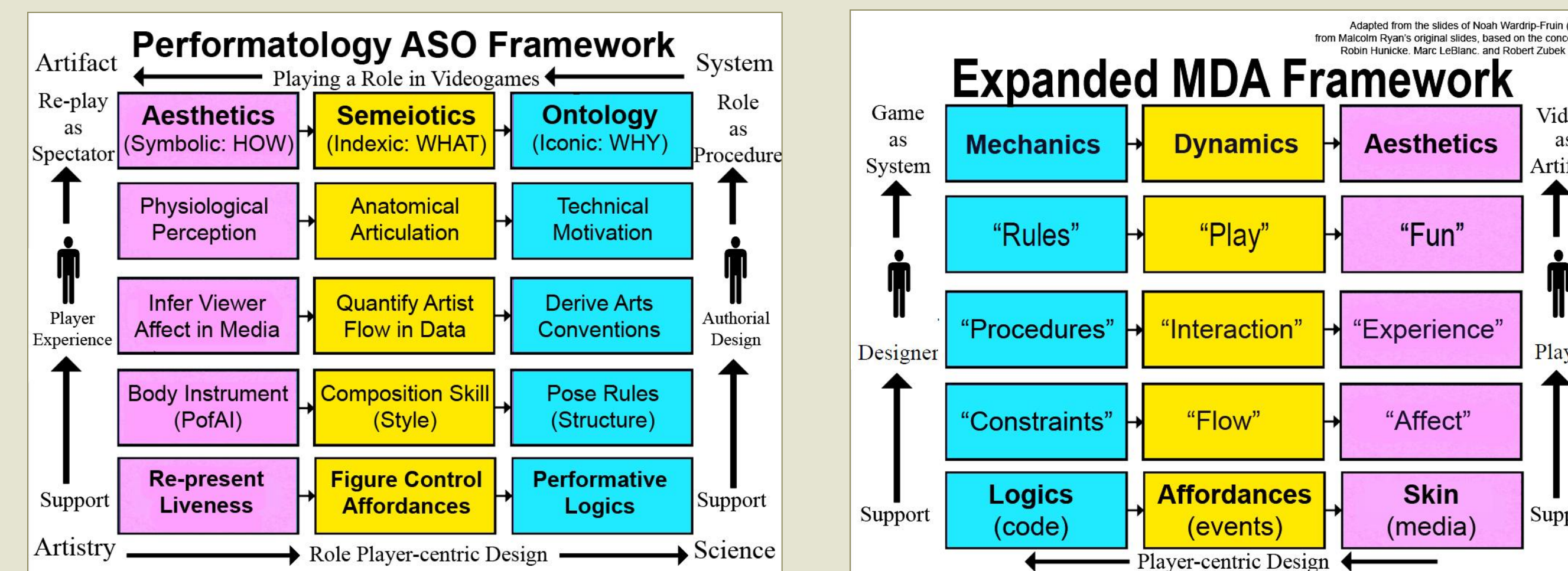
## AI Research Context

- Performatology formalizes *how* figure artists use composition rules to create visually interesting poses, and is the layer of procedural content generation (PCG) that is associated with acting. Figure composition is one dimension of play in avatar role play.



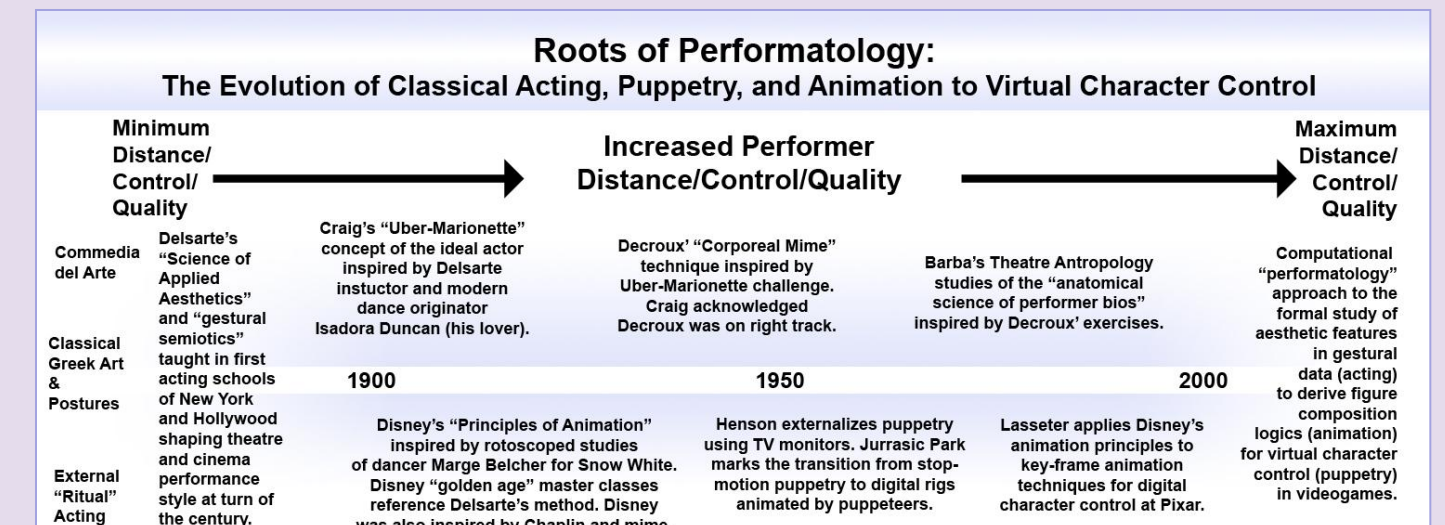
## Videogame Design Context

- Performatology ASO model inverts and expands on the popular MDA design framework, while specifying a structure-style decomposition for designing a performative role play experience.



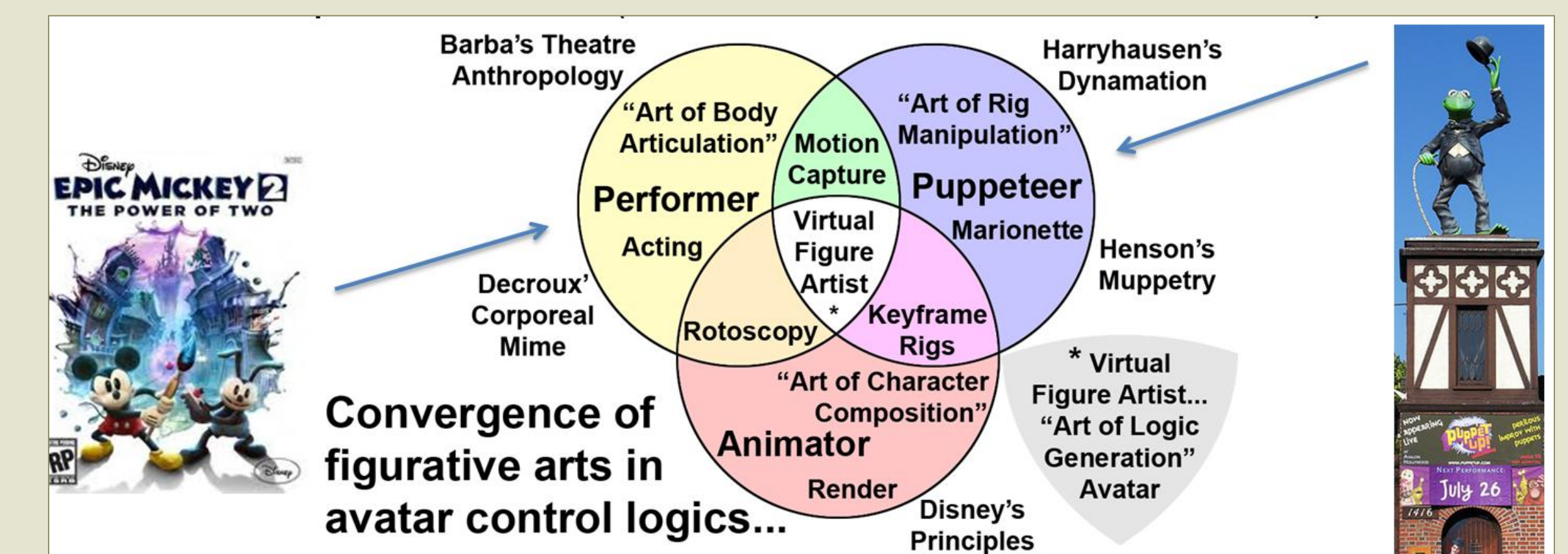
## Critical Technical Practice

- Critical technical practice (CTP), that critiques the intelligent virtual agent (IVA) approach to gesture realism.
- The logics behind artistic and natural gesture are *not* the same!
- Evolved from UCSC DANM MFA *Magic Mirror Game* performances.
- Arts Problem:** How can a fictive body be consistently articulated for maximum aesthetic affect on a spectator?



## Future of Avatar Control

- Thesis:** Computational aesthetics experiments to *quantify* artistic gesture data, consisting of composition metrics and viewer preference studies that *correlate* performer skill with pose quality, will provide a performatology *model* for operationalizing the art of figure control.
- Semi-autonomous avatars for role play will converge all figure control methods into a new virtual instrument for artistic performance.



- While there is some intelligence in digital rigs today (breathing, cloth & hair dynamics, muscles, and fingers), what is *missing* is low-level figure composition logics.



## References

- More Performatology info: [www.performatology.com](http://www.performatology.com)
- DFS Study: Maraffi, Ishikawa, Jhala. (2013). *Inferring Performer Skill from Aesthetic Quality Features in a Dance Game Gesture Corpus*. Games & Aesthetics Workshop, AIIDE'13.
- Technical Report: Maraffi, Jhala. (2013). *Raising the Aesthetic Quality of Character Interaction in Cinematic Videogames*. UCSC-SOE-01-13.