* Project title (make this the title of the post too)

Virtual Context Interaction with Computer Vision

* Key project image
* Names of the group of members if more than one (important!)
* Project description (250 words max) - describes your collection of studies

My series of studies focus on simulating nature power through computer graphic algorithms by using PoseNet and Clmtrackr, which are introduced in class. With these API for P5.js, I am able to use a webcam to track my body and face turning them into controllers. By moving the hands, head, or mouth, viewers can affect the particles' movement and trigger an event in my study. Augmented Reality is a popular research and marketing topic recently; my project attempts to explore the possibility of interaction with the virtual elements while applying the physical space and how our body is engaged in the interconnection. Direct and metaphoric control are the two main methods; one can trigger an even directly by doing a certain action, while the other can affect the track of the elements predefine by the algorithm. Daniel Shiffman's tutorials on the particle movement algorithm provided the fundamental of my work; all the graphic generating on my works is based on his tutorials. As my professors, Kate Hartman and Nicholas Puckett, provide amazing tutorials on body Tracking to trigger events and draw shapes with the Face Tracking API.

* For each study:
  + "Present" Link for Code (under File -> Share in the web editor)
  + "Edit" Link for Code (under File -> Share in the web editor)
  + gif or video of the interaction with sketch and video feed side-by-side
  + Screenshot from video - key moment in interaction
  + Brief description of study including observations and reflections about the interactive experience (100 words)

<https://jieguann.github.io/CreationAndComputation/BodyAsControl/work/Sketch1/>

<https://jieguann.github.io/CreationAndComputation/BodyAsControl/work/Sketch2/>

<https://jieguann.github.io/CreationAndComputation/BodyAsControl/work/Sketch3/>

<https://jieguann.github.io/CreationAndComputation/BodyAsControl/work/Sketch4/>

<https://jieguann.github.io/CreationAndComputation/BodyAsControl/work/Sketch5/>

1. This sketch attempts to immerse the viewers to a dark night influence by Van Gogh and observe and interact with the star's movement on the screen. The viewers should raise one of their hands in front of their webcam, move the hand slowly to observe how it affects the stars' movement. The algorithm of the direction of the stars is based on the Perlin Noise, which Shiffman introduces. By modifying the noise wave with the hand position, the star's track will follow the position of the viewers' hand.

2. The sketch positions the viewers into a universe space and turns their head into a black hole to attract the photons on the dark space. By moving their head on the space, the viewers can see how the photons follow it. Such moving can create a real-time interactive animation to simulate how a black hole work in the universe. This work follows the tutorial of 2D Black Hole Visualization from Shiffman to create the black hole's attraction algorithm. To make the black hole follow the people's head, I get the nose's keypoint and attach the holo on it.

3. This sketch provides the fish experiment to the viewers. By applying a dark blue effect on the video, the viewers will feel they are in the deep sea. When the viewers open their mouths, they will find bubbles are coming out. Such a present creates an augmented reality experiment for viewers by using their mouth to trigger a virtual event on the screen. I think this interaction expands the Human-Computer Interface question without physical touch. In order to trigger the bubble event by opening the mouth, get the top and down points from the mouth, and calculate the distance. The distance between these two points will affect the speed of the bubble particles.

4. Like the third sketch, this practice uses one-third of the screen size to create a river, for viewers to have a virtual diving experiment. Once the viewers' nose is under the water, bubbles will come out. The sketch uses the Face Tracking API to track the nose's point, and once the position of the nose below to one-third of the screen, the bubble even will be triggered.

5.The sketch attempts to immerse the viewers into a starfield, and they are able to control their speed of flying on the space. I visualized a speed controller in the middle; viewers can move it up and down by moving their faces. When the controller goes up, the speed of moving on the space goes faster. Shiffman's tutorial starfield in processing inspires this sketch. Traditionally, controlling the speed of a plane usually through hands. Nevertheless, with the development of computer vision techniques, I believe more innovation of interaction between humans and machines will be developed.

* Project Context (300-500 words)  
  Write about 2-4 references to related articles, papers, projects, or other work that provide context for your project. Discuss the relationship between your project and these references. Be sure to include a bibliography and use a consistent citation style.

As Levin described, the algorithms of Computer Vision are used in artworks increasingly to track people’s activaties (475). He said that, “Techniques exist which can create real-time reports about people’s identities, locations, gestural movements, facial expressions, gait characteristics, gaze directions, and other characteristics” (Levin, 475). Experiment 1 is a great practice for us to try computer vision, as using the pre-train model to simplified the process. It help us explore how the computer can understand human’s activaties through the camera.

Senior addressed five major paradigms for vision-based interactive artwork, and my sketchs should belong to the Mirror Interface (37). Mirror interface is a principal paradigm of interactive art that present a mirro-like surface to the viewers (Senior, 38). She introduced that “Magic Morphin Mirro”(1997) by Darrell et al is an image captured by camera, and the viewers will find their faced distort and warp. The faces are detected and tracked by face detection algorithm and applying the complex effect on it (Senior, 38). My sketches use webcame to capture the video of human and reflect on the screen. By capturing the face and body movement, the real-time videos are applied effect and trigged evens.

As Shao presented a way to interacte with the virtual context through IoT-enabled devices (439), I believe the Interaction with virtual content should be awareed. The extended “Toward Visualization and Interaction with Hybrid Objects and Avatars” acquire more information from the context, using computer vision to capture how many people on the room to effect the emotion of the avatar’s emotional state through fuzzy logic is my interested aspect (Guan, 857). This is what my propose that the metaphoric interaction. The reflection of the agent is not directly control by human, otherwise the human activaties affect it within the an algorithm. It is similar to my sketch one that the human’s hand movement affect the moving of the star.

Guan, Jie, et al. "Exploring a Mixed Reality Framework for the Internet-of-Things: Toward Visualization and Interaction with Hybrid Objects and Avatars." *2020 IEEE Conference on Virtual Reality and 3D User Interfaces Abstracts and Workshops (VRW)*. IEEE, 2020.

Levin, Golan. "Computer vision for artists and designers: pedagogic tools and techniques for novice programmers." *AI & SOCIETY* 20.4 (2006): 462-482.

Senior, Andrew W., and Alejandro Jaimes. "Computer vision interfaces for interactive art." *Human-Centric Interfaces for Ambient Intelligence*. Academic Press, 2010. 33-48.

Shao, Yiyi, Nadine Lessio, and Alexis Morris. "IoT avatars: mixed reality hybrid objects for core ambient intelligent environments." *Procedia Computer Science* 155 (2019): 433-440.