"So, do you know what I'm thinking right now?"

"Well, I take it from your tone that you're challenging me. Maybe because you're curious how I work? Do you want to know how I work?"

This is the first conversation between Theodore and his personalized Operating System, Samantha, in the sci-fi movie *Her*. Samantha understands Theodore's emotions, and develops a romantic relationship with him.

Emotions are believed to be the antonym of science and engineering, especially in machine intelligence. This attitude complicates research on the intersection of affect and AI, fueling uncertainties and controversies. However, I've decided to challenge this convention by proving that affective machines are possible, and indeed beneficial for our society. Therefore, I wonder: how could I design machines capable of recognizing, expressing, and even feeling emotions?

As my first attempt at building an "affective machine," I initiated an AI research project on Sentiment Analysis titled *When Siri Knows How You Feel: Study of Machine Learning in Automatic Sentiment Recognition from Human Speech*, devoting these past two years to learning how to move this sci-fi fantasy one step closer to reality.

"Yeah… actually how do you work?"

"Well, basically, I have intuition. I mean, the DNA of who I am… is based on the personalities of the programmers who wrote me. But what makes me 'me' is my ability to grow through my experiences. So basically, in every moment, I'm evolving. Just like you."

What Samantha says about her "ability to grow through [her] experiences" is essentially Machine Learning (ML), where "experiences" are data. My job is to construct the right "DNA" for the affective machine—the ML architecture—from data collection and feature extraction to classifier training.

I focused on sentiment recognition- a typical "Black Box problem" where people conveniently ignore the opaque processes between input and output. To me, the Black Box was intriguing. However, manual data processing was time-consuming and gathering references including textbooks and PhD theses took up significant memory space in my brain and hard disk. Sometimes I felt engulfed in the complete darkness of the Black Box, where everything was unknown, puzzling, and intimidating. It was painful to stare at the bright screen colonized by ant-like numerals and haunted by monstrous error alerts. It was 4am, 5am, 6am... I lay awake, my thoughts spiraling into a black hole of questions - Why was there an error in the Praat script? Why wouldn't the Neural Network *work*? Occasionally, a beam of inspiration escaped the darkness, and I'd spring up from bed, back to my files and codes.

Trials and errors and more trials. Eventually, I designed a system that could accurately and semi-automatically recognize sentiments from natural human speech.

"Um what's wrong?"

"Nothing."

"It just made me think of you, you know what I mean?"

"Yeah, yeah of course I think that's great…"

"All right, well, you sound distracted. So, we'll talk later?"

Successful results were never the finishing line for me; there was always one step further. My solution was imperfect given complex human emotions—we respond with "Nothing, I'm fine", but feel quite the opposite. So, I redesigned the experiment by combining the acoustic and linguistic features, and the results showed dramatic improvements—a pleasant surprise! But here comes another problem—how could a machine fit emotion cues into context and discern which is more salient? Like a Mobius strip, problems and solutions are twisted on the same plane—each solution inspires new questions.

To answer these new questions, I realized that affective computing is not only a technical challenge—we also need keen insights from many other scientific and humanities disciplines. I consulted with a drama teacher about the aspects of speech salient to sentiment, since actors "dissect" emotions in order to act them out. I also participated in a neuroscience camp to learn about research at the intersection of brain and machine, such as neural network models and brain–computer interface (BCI). Reading AI philosophy also made me more deeply ponder the puzzling questions about mind and machine. Inspired to take another step forward, I've also embarked on a research internship project that aims to meet the engineering goal of emotion recognition by bringing together deep learning, emotion theory, and BCI. My experiences, therefore, have inculcated in me a philosophy of treating engineering challenges in AI not as isolated problems, but as problems that involve a confluence of factors and multidisciplinary considerations.

"The challenge of affective computing is formidable, and not without risk, but it stands to move technology in a radically different direction: towards embracing part of the spark that makes us truly human." Rosalind Picard concluded her book *Affective Computing* with this apt remark. Embracing the risk and opportunity ahead, I am ready to pursue further and deeper towards this challenge, to put together the different pieces of the jigsaw puzzle to infuse emotions in machines.