

Reflective Piece

Science and Communication Module

By Iviwe Booï

When I began my Bioinformatics Honours year at the University of Cape Town, I expected the greatest challenge to be learning new machine learning models and implementing complex algorithms. Coming from a Computer Science background, I was comfortable with programming and software development, but I quickly realised that research requires a very different way of thinking. Rather than simply building solutions to predefined problems, research demands curiosity, patience, critical thinking, and the willingness to accept uncertainty. Throughout this year, I have learned that asking meaningful questions is often more important than immediately finding the right answers.

My research project investigates whether a deep learning model called the Hyperspectral Generative Adversarial Network (HSGAN) can reconstruct hyperspectral facial skin images from ordinary RGB photographs. Although I was excited by the project, I initially found the literature overwhelming. Concepts such as hyperspectral imaging, spectral reconstruction, transfer learning, and spatial-spectral attention were completely unfamiliar to me. Reading research papers was also far more difficult than I anticipated. At first, I approached papers as if they were textbooks, trying to understand every sentence before moving on. Eventually, I realised that scientific papers are conversations between researchers. Learning to identify the research problem, understand the proposed methodology, evaluate the results, and recognise the limitations of a study fundamentally changed the way I read scientific literature.

One of the most rewarding aspects of this honours project has been working at the intersection of artificial intelligence and biomedical imaging. Before this year, my experience with artificial intelligence was largely centred around software applications and computer vision tasks. Through this research, I discovered how machine learning can contribute to healthcare by making advanced imaging technologies more accessible. The possibility of reconstructing detailed spectral information from a conventional RGB image demonstrated how computational methods can potentially reduce reliance on expensive medical

imaging equipment while expanding access to valuable diagnostic information. This interdisciplinary nature of bioinformatics has shown me how computing can contribute meaningfully to solving real-world healthcare challenges.

Another significant challenge throughout the year was balancing my honours studies with my responsibilities as a Software Engineering AI Graduate at Takealot. Managing research deadlines alongside full-time work required careful planning, discipline, and consistency. There were many evenings where I had to transition from solving software engineering problems to reading biomedical imaging papers or debugging machine learning code. At times, progress felt frustratingly slow, particularly when experiments did not produce the expected outcomes or when understanding a new concept required several days of reading. Looking back, however, these moments taught me resilience and reinforced the importance of consistent effort rather than relying on short bursts of productivity.

Perhaps the most valuable lesson I learned this year is that research is not simply about achieving impressive results. Before beginning my honours project, I believed success meant building a model that outperformed previous work. Over time, I came to appreciate that research is equally about understanding why methods succeed, recognising their limitations, and contributing knowledge even when the results are unexpected. A negative result, if carefully analysed, can still answer an important scientific question and help guide future research. This shift in perspective has changed the way I think about experimentation and scientific inquiry.

The Science and Communication module introduced another important dimension of research that I had not fully appreciated before: the ability to communicate science effectively. Researchers often become comfortable using technical language that is difficult for non-specialists to understand. This assignment challenged me to explain complex ideas in a way that is both engaging and accessible without sacrificing scientific accuracy. I realised that scientific discoveries have little impact if they remain confined to academic journals. Effective science communication helps bridge the gap between researchers and society, allowing more people to appreciate how scientific advances can improve everyday life.

Reflecting on the year as a whole, I can confidently say that this honours programme

has changed the way I approach learning. I have become more comfortable with uncertainty, more willing to ask difficult questions, and more appreciative of collaboration and constructive feedback. Beyond learning about hyperspectral imaging, deep learning, and biomedical data, I have developed habits of critical thinking and lifelong learning that I believe will remain valuable throughout my career.

As I continue my journey in software engineering and artificial intelligence, I hope to carry these lessons with me. Whether I pursue research or work in industry, I want to continue building technologies that solve meaningful problems while remaining curious about the questions that still need answering. This honours experience has not only strengthened my technical abilities but has also shaped the way I think about science, innovation, and the responsibility of communicating knowledge to others.

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