# Detecting Change using HTM for a Security Surveillance Application

Mennatallah Elsayed [a], Wim J.C Melis

*School of Engineering Science, University of Greenwich, Central Avenue, Chatham Maritime ME44TB, Kent, United Kingdom*

*For Correspondence [a]: Menna.Osama.Wasfy@Gmail.com*

Detecting change is part of human nature. Humans build up virtual images of their surroundings over time and notice any change instantly which all happens thanks to their brain. While all of this is functions very well in the human brain, there are substantial benefits to an efficient change detection mechanism, but then created virtually. To replicate the structural and algorithmic properties of the human brain, this paper presents a system based on Hierarchal Temporal Memory (HTM) to detect change in a series of images. Moreover, it integrates the change-detecting HTM machine into a robotic security guard, responsible for monitoring and guarding valuable items. The system was designed to serve a security surveillance application to process and analyse several image inputs during non-working hours and identifying changes e.g. related to unauthorised access. The input to the system is a series of multiple images that were initially processed with MATLAB in order to resizing them from a 256*256 matrix to a smaller size, to then convert them into a single line vector in CSV format to suit HTM's input requirements. In the various tests being performed, it is shown that HTM detects spatial as well as temporal anomalies, when they occur once or twice, however, if the pattern occurs more regularly, then it gets learned and becomes a familiar pattern, meaning it is no longer detected as an anomaly.

Mennatallah Elsayed is currently an MSc student at the University of Greenwich, in the UK, studying a full-time programme in Electrical and Electronics Engineering. She was awarded a dual Bachelor of Science (BSc) degree in Electrical Systems Engineering, from MSA University in Egypt and the University of Greenwich in the UK. Her MSc dissertation entitled "Detecting Change using HTM for a Security Surveillance Application" presents a system that uses Hierarchal Temporal Memory (HTM) technology that replicates the structure of the human brain in detecting change in a series of images.

Dr Wim JC Melis currently works at the University of Greenwich. Previously, he worked as a patent examiner at the European Patent Office, and as a CEO Fellow at the University of Tohoku Japan. He obtained his PhD and second MSc at Imperial College London and first MSc in Belgium. His research interests lie in the area of optimising the overall efficiency of a system at system level by developing cross-disciplinary solutions that go back and question basic principles. He approaches these challenges holistically to the areas of computer hardware design for AI and sustainable energy generation.