



# THE SHAPE OF DATA AND ARTIFICIAL INTELLIGENCE

**The CGTA DISTINGUISHED LECTURE**  
**By Professor Gunnar Carlsson**  
**(Stanford University and Ayasdi)**

**Date:** Monday, 17th June 2019, 3pm

**Venue:** University of Southampton, Highfield Campus,  
Building 54, Lecture room 4A

**Organiser:** The Centre for Geometry, Topology, and Applications

**Abstract:** Topological techniques (broadly construed) are turning out to be very useful in making sense of large data sets, and this fact has important consequences for artificial intelligence. The ideas involve the adaptation of homological methods as well as standard methods of homotopy theory to support the unsupervised analysis of complex data. I will discuss these methods, with examples of various kinds including the analysis of data sets arising out of deep learning, an extremely popular methodology for machine learning. We will also demonstrate that applications go beyond simple analysis of the algorithms but also permit the construction of architectures for efficient neural networks.



**About the speaker:** The Centre for Geometry, Topology, and Applications is delighted to host Professor Gunnar Carlsson for its annual Distinguished Lecture. Professor Carlsson is a world expert in algebraic topology, who has made numerous contributions to the subject, including a proof of Segal's Burnside conjecture, Sullivan's fixed point conjecture, and many others. He made foundational contributions to equivariant stable homotopy theory, algebraic K-theory and applied algebraic topology. He pioneered topological data analysis and his vision shaped the subject and its initial research directions. He made numerous contributions to TDA, including the mapper algorithm which is a key tool in this area. In 2008 he co-founded the company Ayasdi which develops cutting edge data-analytic methodologies based on topology. He is a Fellow of the American Mathematical Society.