

ANDREA NANETTI

School of Art, Design and Media at NTU, Singapore



Andrea Nanetti's university education is in Medieval and Renaissance studies (Italy, France, Germany, Greece, USA) at the intersections of historical, philological, aesthetic, anthropological, and computational methodologies. As a scholar he focuses on innovation and change in heritage interpretation and transmission processes at the intersections of (digital) humanities and data science/visualisation. He applies multidisciplinary and trans-disciplinary methods to identify case studies for interdisciplinary and cross-disciplinary teamwork investigations, that resulted in 10 books and more than 50 other scholarly publications in English, Italian, Chinese, Spanish and

Modern Greek on heritage science focused on: global histories of intercontinental networks, national art-heritage-politics relationships, territorial man-heritage-landscape systems, and, more recently, cultural and biological heritage systems in human interpretation of the external world (seen as artificial intelligence amplification ante litteram). At Nanyang Technological University Singapore, he serves as Associate Professor of the School of Art, Design and Media, Senior Research Team Member of the Complexity Institute, and Faculty Member of the University Scholarly Program. He also serves the academic field of heritage science as Vice-Director of the International Research Centre for Architectural Heritage Conservation at Shanghai JiaoTong University, Senior Researcher at the European Centre for Living Technology of the University of Venice Ca' Foscari, member of the College of Professors of the graduate School of Architecture at the University of Florence, and in the Board of Directors of the Maniatakeion Foundation.

CHEONG SIEW ANN

School of Physical and Mathematical Sciences at NTU, Singapore



Dr CHEONG Siew Ann was born in Singapore in 1969. After getting through his primary, secondary, and junior college education in Ama Keng Primary School, the Chinese High School, and Hwa Chong Junior College respectively, and thereafter a contract service with the Singapore Armed Forces, he studied physics at the National University of Singapore. He graduated in 1997 with a BSc (Hons) degree in physics, and went on to obtain his PhD in theoretical condensed matter physics from Cornell University in 2006. He then spent a year and a half as a postdoctoral associate with the Cornell Theory Center, working on biological sequence segmentation, before

joining the Nanyang Technological University as an Assistant Professor in Physics and Applied Physics in August 2007. His main research interest is in developing data analysis methods and toy models for understanding the dynamics of complex systems such as biological macromolecules, the brain, earthquakes, financial markets, and infectious diseases. In particular, he works extensively with high-frequency, large-volume time series data, to cluster them, segment them, and also to estimate complex networks based on significant events in such data. His other research interests are in the areas of computational physics and condensed matter physics.

Interactive Global Histories and the Maritime Space (1205-1533)

As more historical databases come online and overlap in coverage, we need to discuss the two main issues that prevent 'big' results from emerging so far. Firstly, historical data are seen by computer science people as unstructured, that is, historical records cannot be easily decomposed into unambiguous fields, like in population (birth and death records) and taxation data. Secondly, machine-learning tools developed for structured data cannot be applied as they are for historical research. We propose a complex network, narrative-driven approach to mining historical databases. In such a time-integrated network obtained by overlaying records from historical databases, the nodes are actors, while the links are actions. In the case study that we present (the world as seen from Venice, 1205-1533), the actors are governments, while the actions are limited to war, trade, and treaty to keep the case study tractable. We then identify key periods, key events, and hence key actors, key locations through a time-resolved examination of the actions. This tool allows historians to deal with historical data issues (e.g., source provenance identification, event validation, trade-conflict-diplomacy relationships, etc.).

On a higher level, this automatic extraction of key narratives from a historical database allows historians to formulate hypotheses on the courses of history, and also allow them to test these hypotheses in other actions or in additional data sets. Our vision is that this narrative-driven analysis of historical data can lead to the development of multiple scale agent-based models, which can be simulated on a computer to generate ensembles of counterfactual histories that would deepen our understanding of how our actual history developed the way it did. The generation of such narratives, automatically and in a scalable way, will revolutionize the practice of history as a discipline, because historical knowledge, that is the treasure of human experiences (i.e. the heritage of the world), will become what might be inherited by machine learning algorithms and used in smart cities to highlight and explain present ties and illustrate potential future scenarios and visionarios.