

Sustainability: Characterization and Principles

Growth philosophy of economy highlights the critical role of sustainability for long-term stability and survival of civilisation. However, the concept of sustainability is not well defined. This PhD project aims to substantially advance theoretical approaches to

1. quantify sustainability using information- and control-theoretic methods;
2. use these methods to understand what are core conditions for sustainability and its achievement

We will specifically focus on information-theoretic measures, including empowerment, which has found use for modeling agents in current Machine Learning, AI and Artificial Life. With these measures, we will characterize the criteria concerning sustainability for systems requiring long-term viability. This will include the characterization of sustainability in larger dynamical systems, including, but not limited to the stability of attractors, and we will use these insights to presage tipping points on the one hand and the capacity for effective intervention on the other. There is the opportunity for you to link these questions towards biological and/or Artificial Life and ecological, but also economical models, as well as towards other models of complex societies.

We invite PhD applications to investigate this complex topic. You will be interested in quantifying sustainability using state-of-the-art methods, especially focused on (but not limited to) information theory and dynamical systems.

You should have a very strong first degree; a very keen interest and motivation in delving into and contributing to a fresh, stimulating and fast-moving research area. An outstanding background in one of the following or a related field is essential: Computer Science, AI, Machine Learning, Physics, Mathematics, Statistics, Mathematical Modelling or any other relevant discipline with a considerable quantitative/computational component. You will have strong skills in programming, and experience in at least one major computer language. A mathematical/numerical background would be highly desirable. Knowledge in probability theory, information theory, or dynamical systems are a strong plus. Experience in data modelling and neural network techniques would also be advantageous.

More information about the topic is available from:

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